A

COURSE

OF

ELEMENTARY READING

IN

SCIENCE AND LITERATURE,

COMPILED FROM POPULAR WRITERS,

FOR

THE USE OF CIRCUS-PLACE SCHOOL;

TO WHICH IS ADDED,

A COPIOUS LIST

OF THE

LATIN AND GREEK PRIMITIVES WHICH ENTER INTO THE COMPOSITION OF THE ENGLISH LANGUAGE.

BY J. M. M'CULLOCH, A.M.
HEAD MASTER OF CIRCUS-PLACE SCHOOL.

EDINBURGH:
PRINTED FOR
OLIVER & BOYD, TWEEDDALE-COURT;
AND
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ADVERTISEMENT.

THE following pages have been compiled under the impression, that a class-book for an initiatory school should consist of lessons on useful subjects rather than of rhetorical passages. Such passages, however admirable as exercises in elocution for those who are already possessed of a considerable degree of intelligence and taste, cannot be perused with advantage by juvenile readers until a course of previous training has prepared them to understand their meaning and appreciate their beauties. Elocution is no doubt an essential branch of a polite education; but it bears no higher relation to general knowledge, than gilding bears to gold, or an accomplishment to an essential qualification; and nothing can be more unreasonable than the prejudice which subjects children to an attempt to make them *fine* readers before any effort has been made to exercise their mental powers.— "Good reading," says a competent judge,* "can never precede the exercise of understanding, or be attained without a stock of information;" and it seems evident

* Poole—Essay on Education.

that a system which professes to discipline the intellectual powers, as well as the organs of speech, is more likely to form the delicacy of taste, the vigour of conception, and the correct and ready judgment, which are essential to a " good reader," than a system in which it seems to be presumed that mere rules are sufficient to supply the place of taste and judgment.

Under this impression the Compiler has admitted into his pages only such lessons as he thought fitted to stimulate juvenile curiosity, and store the mind with useful knowledge. In selecting his subjects he has been guided, in a great measure, by the example set him in the admirable initiatory Manuals* of Dr Thomson, to which the present volume is intended as a sequel; and he has used the same freedom as their distinguished Author, in making such alterations on his extracts as the practical purposes he had in view seemed to require. Great space has been allotted to Natural Philosophy and Natural History; but no greater, he is convinced, than the claims of these sciences and the character of the present age justify. Those who have not attended to the subject, can have no idea of the avidity with which very young children listen to details of natural history and explanations of common phenomena; and it is surely impossible to introduce youth too early to studies which

* Lessons for Schools, Parts I., II., III., and IV

tend more than any other, not only to form and consolidate habits of observation and reflection, but to fill the mind with admiration of the contrivance and wisdom manifested in every part of creation.

The List of Latin and Greek Primitives, given in the Appendix,—although a novelty in a work of this description,—requires no apology. Besides being indispensable to enable the pupil to understand the *meaning* of what he reads, it will serve as a preparation for the study of the learned languages, if not as a partial substitute for them.

EDINBURGH, 1st July, 1827.

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THE voice, in reading, has two essential turns or inflections, the *rising* and the *falling*. The *rising* inflection is that upward turn of the voice which we generally use in asking a question beginning with a verb, and is marked with the acute accent (ʹ). The *falling* inflection is that downward sliding of the voice which is commonly used at the end of a sentence, and is designated by the grave accent (ˋ). These two inflections have been justly described as the axis on which the force, variety, and harmony of speaking turn, and they therefore cannot be too fully exemplified to the pupil.

EXAMPLES.

The Rising followed by the Falling.

Does he talk rationallyʹ, or irrationallyˋ?
Does he pronounce correctlyʹ, or incorrectlyˋ?
Does he mean honestlyʹ, or dishonestlyˋ?
Does she dance gracefullyʹ, or ungracefullyˋ?
Do they act cautiouslyʹ, or incautiouslyˋ?
Should we say humourʹ, or humourˋ?
Should we say altarʹ, or altarˋ?
Should we say amberʹ, or amberˋ?
Should we say airyʹ, or airyˋ?
Should we say eagerʹ, or eagerˋ?
Should we say oceanʹ, or oceanˋ?
Should we say oozyʹ, or oozyˋ?
Should we say emptyʹ, or emptyˋ?

The Falling followed by the Rising.

He talks rationallyˋ, not irrationallyʹ.
He pronounces correctlyˋ, not incorrectlyʹ.
He means honestlyˋ, not dishonestlyʹ.
She dances gracefullyˋ, not ungracefullyʹ.
They acted cautiouslyˋ, not incautiouslyʹ.
We should say humourˋ, not humourʹ.
We should say altarˋ, not altarʹ.
We should say amberˋ, not amberʹ.

We should say airy\`, not airy′.
We should say eager\` not eager′.
We should say ocean\`, not ocean′.
We should say oozy\`, not oozy′.
We should say empty\`, not empty′.

A great number of rules are given by Mr Walker and his followers for the inflecting of sentences or parts of sentences; but the following comprise all that are essential:—

I. AFFIRMATIVE SENTENCES.

1. WHERE the sense is complete, whether it be at the termination of a sentence or of a clause of a sentence, use the falling inflection.

2. In negative sentences, on the contrary, or negative members of sentences, use the rising inflection.

3. When sentences are divisible into two parts, the commencing part is distinguished by the rising inflection.

EXAMPLES.

1. It is to the unaccountable oblivion of our mortality, that the world owes all its fascination\`.

Age, in a virtuous person, carries with it an authority, which makes it preferable to all the pleasures of youth\`.

Every desire, however innocent or natural, grows dangerous, as, by long indulgence, it becomes ascendant\` in the mind.

You may lay it down as a maxim, confirmed by universal experience, that every man dies as he lives\`; and it is by the general tenor of the life, not a particular frame of mind at the hour of death, that we are to be judged at the tribunal of God.

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2. The religion of the gospel is not a gloom′y religion.

I cannot, I will not join in congratulation on misfortune and disgrace′.

Greatness confers no exemption from the cares and sorrows of human′ity.

It is not enough that you continue steadfast and immovable′—you must also abound in the work of the Lord, if you expect your labours to be crowned with success.

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3. *If to do were as easy as to know what were good′ to do*—chapels had been churches, and poor men's cottages, princes' palaces.

While dangers are at a distance, and do not immediately′ approach us—let us not conclude that we are secure, unless we use the necessary precautions against them.

As the beauty of the body always accompanies the health′ of it—so is decency of behaviour a concomitant to virtue.

No man can rise above the infirmities of nature′, unless assisted by God.

Your enemies may be formidable by their numbers, and by their power′—but He who is with you is mightier than they.

Virtue were a kind of misery′, if fame were all the garland that crowned her.

To all the charms of beauty, and the utmost elegance of external form′, Mary added those accomplishments which render their impression irresistible.

Cæsar was celebrated for his great generosity′—Cato for his unsullied integrity.

The only exception to these rules worthy of notice occurs in the case of antithetical sentences. When the commencing member of an antithesis requires the relative emphasis, or is opposed in the concluding member by a negation, the latter has the rising, and the former the falling inflection—as in the following examples:—

We have taken up arms to defend‵ our country′, not to betray′ it.

The duty of a soldier is to obey‵, not to direct his general.

II. INTERROGATIVE SENTENCES.

1. QUESTIONS asked by pronouns generally end with the falling inflection.

2. Questions asked by verbs generally require the rising inflection.

3. When the question affects two objects, taken *disjunctively*, the former has the rising, and the latter the falling inflection.

EXAMPLES.

1. What evil can come nigh to him for whom Jesus‵ died?

2. Shall dust and ashes stand in the presence of that uncreated glory, before which principalities and powers bow down, tremble, and adore′? Shall guilty and condemned creatures appear in the presence of Him, in whose sight the heavens are not clean, and who chargeth his angels with folly′?

3. Are you toiling for fame′, or for fortune‵?

(1.) Who are the persons that are most apt to fall into peevishness and dejection‵? that are continually complaining of the world, and see nothing but wretchedness‵ around them? (3.) Are they the affluent′ or the indigent‵? (2.) Are they those whose wants are administered to by a hundred hands besides their own′? who have only to wish and to have′?—Let the minion of fortune answer you. (2.) Are

they those whom want compels to toil for their daily meal and nightly pillow'—who have no treasure, but the sweat of their brows' —who rise with the rising sun, to expose themselves to all the rigours of the seasons, unsheltered from the winter's cold, and unshaded from the summer's heat'? No! the labours of such are the very blessings of their condition.

III. PARENTHESIS.

The general rule for the parenthesis is, that it must be pronounced in a lower tone and more rapidly than the rest of the sentence, and conclude with the inflection that immediately precedes it. A simile, being a species of parenthesis, follows the same rule.

EXAMPLES.

Notwithstanding all this care of Cicero, history informs us that Marcus proved a mere blockhead; and that na'ture (who, it seems, was even with the son for her prodigality to the fa'ther) rendered him incapable of improving, by all the rules of elo`quence, the precepts of philo`sophy, his own endea`vours, and the most refined conversation in A`thens.

Then went the captain with the officers, and brought them without vi`olence (for they feared the people, lest they should have been ston`ed); and when they had brought them, they set them before the council.

IV. ECHO.

The title Echo Mr Walker has adopted to express a repetition of a word or phrase. The echoing word is pronounced with the rising inflection and a considerable pause after it.

EXAMPLE.

Newton was a Christian! *New'ton!* whose mind burst forth from the fetters cast by nature on our finite conceptions—*New'ton!* whose science was truth, and the foundation of whose knowledge of it was philosophy; not those visionary and arrogant presumptions which too often usurp its name, but philosophy resting on the basis of mathematics, which, like figures, cannot lie—*New'ton!* who carried the line and rule to the utmost barriers of creation, and explored the principles by which, no doubt, all created matter is held together and exists.

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SECTION I.

ON THE PLEASURES OF SCIENCE.

That every man is capable of being delighted with extending his information upon matters of science, will be evident from a few plain considerations. Reflect how many parts of the reading, even of persons ignorant of all sciences, refer to matters wholly unconnected with any interest or advantage to be derived from the knowledge acquired. Every man is amused with reading a story; a romance may please some, and a fairy-tale may entertain others; but no benefit beyond the amusement is derived from this source: the imagination is gratified; and we willingly spend a good deal of time and a little money in this gratification, rather than in rest after fatigue, or in any other bodily indulgence. It is of little importance to inquire, why and how these things excite our attention, and wherefore the reading of them is a pleasure: the fact is certain; and it proves clearly that there is a positive enjoyment in knowing what we did not know before; and *this pleasure is* greatly increased when the in-

formation is such as excites our surprise, wonder, or admiration. Most persons who take delight in reading tales of ghosts, which they know to be false, and feel all the while to be silly in the extreme, are merely gratified, or rather occupied, with the strong emotions of horror excited by the momentary belief, for it can only last an instant. Such reading is a degrading waste of precious time, and has even a bad effect upon the feelings and the judgment. But true stories of horrid crimes, as murders, and pitiable misfortunes, as shipwrecks, are not much more instructive. If it be a pleasure to gratify curiosity—to know what we were ignorant of—to have our feelings of wonder called forth, how pure a delight of this very kind does natural science hold out to its students! Recollect some of the extraordinary discoveries of mechanical philosophy. How wonderful are the laws that regulate the motions of fluids! Is there any thing in all the idle books of tales and horrors more truly astonishing than the fact, that a few pounds of water may, by mere pressure, without any machinery, by merely being placed in a particular way, produce an irresistible force? What can be more strange, than that an ounce weight should balance hundreds of pounds, by the intervention of a few bars of thin iron? Observe the extraordinary truths which optical science discloses! Can any thing surprise us more, than to find that the colour of white is a mixture of all others; that red, and blue, and green, and all the rest, merely by being blended in certain proportions, form what we had fancied rather to be no colour at all, than all colours together? Chemistry is not behind in its wonders. That the diamond should be made of the same material with coal; that water should be chiefly composed of an inflammable substance; that acids should be almost all formed of different kinds of air; and that one of those acids, whose strength can dissolve almost any of the metals, should be made of the self-same ingredients with the common air we breathe; that salts should be of a metallic nature, and composed, in great part, of metals, fluid like quicksilver, but lighter than water, and which, without

any heating, take fire upon being exposed to the air, and, by burning, form the substance so abounding in saltpetre and in the ashes of burnt wood: these, surely, are things to excite the wonder of any reflecting mind—nay, of any one but little accustomed to reflect. And yet these are trifling when compared to the prodigies which astronomy opens to our view: the enormous masses of the heavenly bodies; their immense distances; their countless numbers and their motions, whose swiftness mocks the uttermost efforts of the imagination.

Akin to this pleasure of contemplating new and extraordinary truths, is the gratification of a more learned curiosity, by tracing resemblances and relations between things which, to common apprehension, seem widely different. It is surely a satisfaction, for instance, to know that the same thing which causes the sensation of heat causes also fluidity, and expands bodies in all directions; that electricity, the light which is seen on the back of a cat when slightly rubbed on a frosty evening, is the very same matter with the lightning of the clouds; that plants breathe like ourselves, but differently by day and by night; that the air which burns in our lamps enables a balloon to mount, and causes the globules of the dust of plants to rise, float through the air, and continue their race—in a word, is the immediate cause of vegetation. Nothing can at first view appear less like, or less likely to be caused by the same thing, than the processes of burning and of breathing,—the rust of metals and burning,—the influence of a plant on the air it grows in by night, and of an animal on the same air at any time, nay, and of a body burning in that air; and yet all these things are the same operation. It is an undeniable fact, that the very same thing which makes the fire burn, makes metal rust, forms acids, and causes plants and animals to breathe; that these operations, so unlike to common eyes, when examined by the light of science, are the same,—the rusting of metals,—the formation of acids,—the breathing of animals,—and the growth of plants by night. *To know this is a* positive gratification. Is it

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1. If we penetrate beneath the surface of the earth, we discover there a very remarkable arrangement. Instead of a generally uniform appearance, as we see on the surface, we pass through divers substances, as clay, gravel, sand, &c., deposited in *beds* or *strata* of various thickness, from a few inches to a great many feet. These lie, for the most part, nearly horizontal; but in some instances, particularly in mountainous countries, they take different degrees of inclination; and in places where the country consists of gently-sloping hills and vales, the beds have a waving or bending form.

These strata, as deep as the curiosity or the necessities of mankind have induced them to explore, satisfactorily demonstrate the wisdom which has been displayed in the arrangement of materials requisite for the use of men and animals. The first layer is frequently a rich black mould, formed almost wholly of animal and vegetable remains; this yields sustenance to the vegetable productions, and thereby becomes the actual, though not the immediate support of the whole animal creation. Beneath this is often found a thick bed of clay, that furnishes to man a substance of which to make bricks, tiles, various kinds of pottery, and innumerable other articles for the comfort of social life. Next are deposited vast beds of gravel, that are of use in numerous points of view. Underneath this are the infinitely-varying strata of sandstone, limestone, &c., which not only serve for the construction of buildings, and for other important purposes, but also frequently surround mines which contain the valuable metals. Beneath a slaty stratum are usually discovered those immense beds of coal so requisite for the comfort, and, in some situations, even for the existence of man. These strata, it is true, are not always found together, nor are they always discovered in the same order; but the statement will suffice to shew the general nature of their arrangement.

The most simple and natural division of minerals is into four classes,—*stones*, *salts*, *combustibles*, and *metals*. *Stones* are subdivided into *earthy* and *saline*; and metals

into *malleable* and *brittle*. The principal things which must be attended to, in order to ascertain their names and characters, are their *form, lustre, fracture, streak, stain, cohesion, flexibility, feel, smell, taste, sound,* and *specific gravity*.

2. The principal parts of plants are the *root;* the *herb, tree,* or *plant* itself; and the *fructification,* or flower and fruit.

The *roots* of plants and trees, having nothing pleasing to the eye, the Creator has, for the most part, hidden from the view; they are nevertheless of great importance in the vegetable economy; they are furnished with a set of vessels by means of which they draw moisture from the earth; and they fix the plant in the spot it is designed to occupy. They are of various kinds, and have different periods of duration; and they are frequently observed to compensate, in an extraordinary manner, for local inconveniences,—changing their direction, for instance, when they meet with a stone; turning aside from barren into fertile ground; and, when stationed on the rocky edge of a deep ditch, creeping down one side and ascending the other, so as to place themselves in richer soil. Lord Kames mentions an extraordinary instance of this power in a plane-tree, of nearly twenty feet in height, which he observed among the ruins of a monastery in Galloway. Straitened for nourishment in its elevated situation, it directed its roots down the side of a wall, till they reached the ground ten feet below. The nourishment afforded by the parent stem, during the time of descending, was then amply repaid, as it almost immediately threw out vigorous shoots; whereas no increase in the branches took place during the period of the root's descent.

The *plant* itself consists of a variety of layers and vessels, curiously arranged, and adapted for performing all the functions of vegetable life. First of all is the *cuticle,* or bark, investing every part of a living plant, and varying in texture from the delicate covering of a flower to *the rough coating of* a pearly aloe. It is furnished with

pores through which air and light are admitted; and it is not only essential to plants in general, but also produces an elegant effect. To the cuticle succeeds a green substance, called the *cellular integument*; then comes the bark, the innermost layer of which is called the *liber*; and lastly, the wood, which sometimes contains within it the pith, supposed to be a reservoir of moisture or vital energy. A variety of concentric circles beautifully diversify the surface of the wood, each of them shewing the growth of a year. The wood itself consists of two parts,—the duramen, or true wood, which is hard and darkly-coloured; and the outer, or alburnum, which is different in appearance, and not yet completely hardened. The sap-vessels ascend from the roots of the tree, through the superficial alburnum, become spiral and enlarged a little below the leaves, and enter them in a circular arrangement round the pith. The food destined to nourish a plant, being absorbed by the root, becomes sap, and is carried up into the leaves by these vessels, where it undergoes a wonderful chemical change, and is brought back, through another set of vessels, down the leaf-stalks into the liber, where it is supposed to deposite the principal secretions of the tree. Thus in the bark of the oak, a tanning principle is thence produced;—in the Peruvian bark, what has been found so beneficial in fevers;—in the cinnamon, its grateful aromatic taste;—in the sandal-wood, its never-dying fragrance, so beautifully noticed in an Arab couplet, which pronounces the duty of a good man a virtuous one, not only in pardoning, but also in benefiting his enemies, as the sandal-tree, at the moment of its overthrow, sheds the sweetest perfume on the axe that fells it.

The parts of fructification are, the calyx, corolla, stamens, pistils, seed-vessel, seeds, and receptacle. The *calyx*, or flower-cup, is the green part which is situated immediately beneath the blossom; the *corolla*, or blossom, is [illegible] coloured part of every flower, on which its beauty [illegible] depends; and the leaves that compose it are [illegible] *petals*. The *stamens* and *pistils* are in the [illegible] the flower, and are the organs on which the

fructification and reproduction of the plant more particularly depend. The former surround the latter, and consist each of a *filament* or thread, and an *anther* or summit; which last, when ripe, contains a fine powder called *pollen*. At the foot of the pistil is situated the *germen*; this, when grown to maturity, has the name of *pericarp*, or seed-vessel, and is that part of the fructification which contains the seeds—whether it be a *capsule* as in the poppy, a *nut* as in the filbert, a *berry* as in the gooseberry, a *pod* as in the pea, or a *cone* as in the fir-tree. The *seed* is so well known as to require no description; and the *receptacle* is the base which connects all the parts of fructification together, and on which they are seated; as, for example, the eatable part of the artichoke.

The Linnæan system of classification of plants is founded upon a supposition, that the stamens represent the *male*, and the pistils the *female* parts of fructification. The whole vegetable creation has been distributed, in this way, into *twenty-four* classes; these are divided into *orders*, which are subdivided into *genera* or tribes; and these genera are further subdivided into *species* or individuals. The Linnæan system is professedly artificial, and its sole aim is to help any one to learn the name and history of an unknown plant in an easy and certain manner.

3. The objects comprehended within the *animal* kingdom are divided into six classes,—*Mammalia*, or mammiferous animals; *Birds*; *Amphibia*, or amphibious animals; *Fishes*; *Insects*; and *Worms*. The class *Mammalia* consists of such animals as produce *living* offspring, and nourish their young ones with milk supplied from their own bodies; and it comprises both the quadrupeds and whales. The class *Birds* comprises all such animals as have their bodies clad with feathers. Their *jaws* are elongated, and covered externally with a horny substance, called a bill or beak, which is divided into two parts, called mandibles. Their *eyes* are furnished with a thin, whitish, and somewhat transparent membrane, that can at pleasure be drawn over the whole external surface like a curtain. Birds *respire* by air-vessels which are ex-

tended through their body; their organs of motion are two *wings* and two *legs;* and they are destitute of external ears, lips, and many other parts which are important to quadrupeds.—Under the third class, or *Amphibia,* are arranged such animals as have a cold, and generally naked body, a lurid colour, and nauseous smell. They respire chiefly by lungs, but they have the power of suspending respiration for a long time; they are extremely tenacious of life, and can repair certain parts of their bodies which have been lost; they are also able to endure hunger, sometimes even for months, without injury. The bodies of some of them, as the turtles and tortoises, are protected by a hard and horny shield or covering; those of others are clad with scales, as the serpents and some of the lizards; whilst others, as the frogs, toads, and most of the water-lizards, are entirely naked, or have their skin covered with warts. Many of the species shed their skins at certain times of the year; and several of them are furnished with a poison which they eject into wounds that are made by their teeth; they chiefly live in retired and morassy places, and, for the most part, feed on other animals. None of them chew their food; they swallow it whole, and digest it very slowly. The offspring of all the tribes are produced from eggs, which, after they have been deposited by the parent animals in a proper place, are hatched by the heat of the sun. The eggs of some of the species are covered with a shell; those of others have a soft and tough skin, not much unlike wet parchment; and the eggs of several are perfectly gelatinous. In those few that produce their offspring alive, as the vipers, and some other serpents, the eggs are regularly formed, but are hatched within the bodies of the females.—*Fishes* constitute the fourth class of animals; they are all inhabitants of the water, in which they move by certain organs called *fins;* they breathe by *gills,* which, in most of the species, are situated at the sides of the head; though in some of the flat fish, as the skate and thornback, they are on the under part of the body. *Fish rise and sink* in the water generally by a kind of

bladder in the interior of their body, called an *air-bladder*. Some of them, as the skate and other flat fish, do not possess this organ, and consequently are seldom found but at the bottom of the water. Several of them are enveloped with a fat and oily substance to preserve their bodies from putrefaction, and also to guard them from extreme cold.—*Insects* are so denominated, from the greater number of them having a separation in the middle of their bodies, by which they are, as it were, cut into two parts. They have in general *six* or more legs, which are, for the most part, nearly of equal length and thickness. Sometimes, however, as in the mole-cricket, the fore-legs are very thick and strong, for burrowing into the ground; sometimes the hind-thighs are long and thick for leaping; or flattened, fringed with hairs, and situated nearly in an horizontal position, to serve as oars for swimming. Most of the insect tribes are furnished also with wings, and with *antennæ,* which serve as instruments of touch, or of some sense which is to us unknown. The *eyes* of insects are formed of a transparent substance, so hard as to require no coverings to protect them. Their *mouth* is generally situated somewhat beneath the front part of the head; and the jaws are transverse, and move in lateral directions. All insects breathe, not through their mouth, but through pores or holes along the sides of their bodies. Their *skin* is, in general, of hard or bony consistence, divided into plates or joints, which admit of some degree of motion, and is generally clad with very short hairs. Nearly all insects go through certain great *changes* at different periods of their existence. From the *egg* is hatched the *larva,* grub, or caterpillar, which is destitute of wings; this afterwards changes to a *pupa* or *crysalis,* wholly covered with a hard shell, or strong skin, from which the *perfect* or *winged* insect bursts forth. Spiders, and some other wingless insects, issue from the egg nearly in a perfect state. The sixth and last class of animals consists of *Worms* or *Vermes*. These are slow of motion, and have soft and fleshy bodies. *In some of the* species, eyes and ears are very

perceptible, while others appear to enjoy only the senses of taste and touch. Many have no distinct head, and most of them are destitute of feet. They are, in general, so tenacious of life, that parts which have been destroyed will be reproduced. These animals are principally distinguished from those of the other classes, by having *tentacula* or feelers.—*Abridged from* BINGLEY'S *Useful Knowledge.*

TO THE SUN-DIAL.

MY ear is pain'd, my heart is sick,
   When all beside is silent round,
To hear the clock's unvaried click
   Repeat its melancholy sound.

'Tis irksome in the dead of night
   To have Time's progress thus made known,
And his irrevocable flight
   Proclaim'd in such a sullen tone.

To know that thus in darkness fly
   Boons far beyond the gift of kings;
That moments—hours—are gliding by,
   Which bear no record on their wings.

Nothing to shew their lapse redeem'd
   From dull Oblivion's barren void;
But idle, useless, unesteemed,
   Have found and left us unemploy'd.

Better I love—since time must pass—
   To witness in the light of day
The noiseless sand-grains in the glass
   By slow succession drop away.

With still more joy to thee I turn,
   Meet horologe for Bard to love,
Time's sweetest flight from thee I learn,
   Whose lore is borrow'd from above.

The worldly use of time may need
   Less cumbrous things its course to tell,

I love thy massive tome to read,
  To read—and—feel its voiceless spell.

I love in some sequester'd nook
  Of antique garden to behold
The page of thy sun-lighted book
  Its touching homily unfold.

On some old terrace-walk to greet
  Thy form, a sight which never cloys,
Is more to thought than drink and meat—
  To feeling than Art's costliest toys.

These seem to track the path of time
  By vulgar means which man has given;
Thou simple, silent, and sublime,
  But showest thy shadowy sign from Heaven.

BARTON.

MOUNT ETNA.

THE majestic Etna, which the ancients considered, not unreasonably, as one of the highest mountains in the world, and on the summit of which they believed that Deucalion and Pyrrha sought refuge, to save themselves from the universal deluge, is situated on the plain of Catania in Sicily.

Its elevation above the level of the sea has been estimated at 10,963 feet, upwards of two miles. On clear days it is distinctly seen from Valetta, the capital of Malta, a distance of 150 miles.

From its base it rises like a vast pyramid, by an acclivity nearly equal on all sides, forming with the horizon an angle, which becomes greater on approaching the crater; the inclination at the base being fifteen, and that at the steepest part of the cone no where exceeding forty-five degrees. This prodigious volcano may be likened to a forge, which, in proportion to the violence of the fire, to the nature of the fossil matters on which it acts, and of the gases which urge and set it in motion, produces, destroys, and reproduces, a variety of forms.

This single mountain contains an epitome of the different climates throughout the world, presenting at once all the seasons of the year, and all the varieties of produce. It is accordingly divided into three distinct zones or regions, which may be distinguished as the torrid, temperate, and frigid, but which are known by the names of the cultivated region, the woody or temperate region, and the frigid or desert region. The former of these extends through twelve miles of the ascent towards the summit, and is almost incredibly abundant in pastures and fruit-trees of every description. It is covered with towns, villages, and monasteries; and the number of inhabitants distributed over its surface is estimated at 120,000. In ascending to the woody or temperate region, the scene changes; it is a new climate, a new creation. Below, the heat is suffocating; but here, the air is mild and fresh. The turf is covered with aromatic plants; and gulfs, which formerly ejected torrents of fire, are changed into woody valleys. Than this nothing can be more picturesque, the inequality of the soil displaying every moment some variety of scene: here, the ash and flowering thorns form domes of verdure; and there, the chestnut-trees grow to a most enormous size. The one called *castagno de cento cavalli*, according to Brydone and Glover, has a circumference of 204 feet. Many of the oaks are also of a prodigious size. Mr Swinburne measured one which had a circumference of 28 feet. The last, or desert region, commences more than a mile above the level of the sea. The lower part is covered with snow in winter only; but on the upper half of this sterile district the snow constantly lies:—

Sometimes the pencil, in cool airy halls,
Bade the gay bloom of vernal landscapes rise,
Or Autumn's varied shades imbrown the walls:
Now the black tempest strikes the astonished eyes,
Now down the steep the flashing torrent flies;
The trembling sun now plays o'er ocean blue,
And now rude mountains frown amid the skies;
Whate'er Lorraine light-touched with soft'ning hue,
Or savage Rosa dashed, or learned Poussin drew.

THOMSON.

The upper part, which may properly be called the cone of Etna, is, in a right line, about a mile, or somewhat more, in ascent. It is described by Sir William Hamilton as a little mountain, about a quarter of a mile perpendicular, and very steep, situated in the middle of a gently-inclined plane, about nine miles in circumference. The cavity was, according to his perception, shaped like a funnel, diminishing until it terminated in a point, and having an outer circumference of two miles and a half round. Great changes have since taken place. Spallanzani also reached the edge of the crater, and found it to be an oval of about a mile and a half in circuit, having its edges in many places indented by projecting lavas or scoriæ. The bottom was nearly a horizontal plane, about two-thirds of a mile in circumference; hence issued a constant column of smoke; and hence, as well as from the sides, arose several streams of smoke, resembling thin clouds. Within the aperture a liquid ignited matter was clearly seen, constantly undulating, boiling, rising and falling, without spreading over the bottom. This was, no doubt, the melted lava which had issued from the bottom of the gulf. Neither of the above travellers, nor Brydone, dared to venture down the crater, which they found too hot; but M. D'Orville, more adventurous, by the means of ropes, which two or three men held at a distance, descended as far as possible. His view was in a great measure intercepted by the small flames and smoke; but in the centre he saw a mass of matter, which rose in the shape of a cone, to the height of about sixty feet.

On the vastness and beauty of the prospect, from the summit of Etna, all authors agree; and Spallanzani observes, that there is not, perhaps, any elevated region on the whole globe which offers at one view so fine an extent of sea and land. M. Houel was stationed there at sunrise, when the horizon was clear, and without a single cloud. The coast of Calabria was, he says, undistinguishable from the adjoining sea; but in a short time a fiery radiance began to appear from behind those Italian hills

which bounded the eastern part of the prospect. The fleecy clouds, which generally appear early in the morning, were tinged with purple; the atmosphere became strongly illuminated, and reflecting the rays of the sun, seemed to be filled with a bright refulgence of flame. Although the heavens were thus enlightened, the sea still retained its dark azure, and the fields and forests did not yet reflect the rays of the sun. The gradual rising of this luminary, however, soon diffused light over the hills which lie below the peak of Etna. This last stood like an island in the midst of the ocean, with luminous points multiplying every moment around, and spreading over a wider extent with the greatest rapidity. It was, said he, as if the world had been observed suddenly to spring from the night of non-existence:—

Ere the rising sun
Shone o'er the deep, or 'mid the vault of night
The moon her silver lamp suspended; ere
The vales with springs were watered, or with groves
Of oak or pine the ancient hills were crowned;
Then the Great Spirit, whom his works adore.
Within his own deep essence viewed the forms.
The forms eternal of created things:
The radiant sun; the moon's nocturnal lamp;
The mountains and the streams: the ample stores
Of earth, of heaven, of Nature. From the first.
On that full scene his love divine he fixed,
His admiration. Till, in time complete.
What he admired and loved his vital power
Unfolded into being. Hence the breath
Of life informing each organic frame:
Hence the green earth, and wild resounding waves;
Hence light and shade, alternate; warmth and cold;
And bright autumnal skies, and vernal showers,
And all the fair variety of things. AKENSIDE.

The most sublime object, however, which the summit of ... nts, is the immense mass of its own colossal ... er region exhibits rough and craggy cliffs, ... cularly, fearful to the view, and surround... mblage of fugitive clouds, to increase the ... f the scene. Amid the multitude of woods

in the middle or temperate region are numerous mountains, which, in any other situation, would appear of a gigantic size, but which, compared to Etna, are mere molehills. Lastly, the eye contemplates with admiration the lower region, the most extensive of the three, adorned with elegant villas and castles, verdant hills and flowery fields, and terminated by the extensive coast, where, to the south, stands the beautiful city of Catania, to which the waves of the neighbouring sea serve as a mirror.

Etna has been celebrated as a volcano from the remotest antiquity. Eruptions are recorded by Diodorus Siculus as having happened 500 years before the Trojan war, or 1693 years before the Christian era.

In 1669, the torrent of burning lava inundated a space fourteen miles in length and four in breadth, burying beneath it a part of Catania, till at length it precipitated itself into the sea. For several months before the lava broke out, the old mouth, or great crater of the summit, was observed to send forth much smoke and flame, and the top had fallen in, so that the mountain was much lowered.

Eighteen days before, the sky was very thick and dark, with thunder, lightning, frequent concussions of the earth, and dreadful subterraneous bellowings. On the 11th of March, about sunset, an immense gulf opened in the mountain, into which when stones were thrown, they could not be heard to strike the bottom. Ignited rocks, fifteen feet in length, were hurled to the distance of a mile; while others of a smaller size were carried three miles. During the night the red-hot lava burst out of a vineyard twenty miles below the great crater, and ascended into the air to a considerable height. In its course it destroyed 5000 habitations, and filled up a lake several fathoms deep. It shortly after reached Catania, rose over the walls, whence it ran for a considerable length into the sea, forming a safe and beautiful harbour, which was, however, soon filled up by a similar torrent of inflamed matter. This is the stream, the hideous deformity of

which, devoid of vegetation, still disfigures the south and western borders of Catania, and on which part of the noble modern city is built.

The showers of scoriæ and sand which, after a lapse of two days, followed this eruption, formed a mountain called *Monte Rosso,* having a base of about two miles, and a perpendicular height of 750 feet. On the 25th the whole mountain, even to the most elevated peak, was agitated by a tremendous earthquake. The highest crater of Etna, which was one of the loftiest parts of the mountain, then sunk into the volcanic gulf, and, in the place which it had occupied, there now appeared nothing but a wide gulf, more than a mile in extent, from which issued enormous quantities of smoke, ashes, and stones.

In 1809, twelve new craters opened about half way down the mountain, and threw out rivers of burning lava, by which several estates were covered to the depth of thirty or forty feet; and during three or four successive nights a very large river of red-hot lava was distinctly seen, in its whole extent, running down from the mountain.

In 1811, several mouths opened on the eastern side of the mountain; being nearly in the same line, and at equal distances, they presented to the view a striking spectacle,—torrents of burning matter, discharged with the greatest force from the interior of the volcano, illuminated the horizon to a great extent. An immense quantity of matter, which was driven to considerable distances, was discharged from these apertures, the largest of which continued for several months to emit torrents of fire. Even at the time when it had the appearance of being choked, there suddenly issued from it clouds of ashes, which descended, in the form of rain, on the city of Catania and its environs, as well as on the fields situated at a very considerable distance. A roaring, resembling that of the sea in the midst of a tempest, was heard to proceed from the interior of the mountain; and this sound, accompanied from time to time by dreadful explosions, resembling thunder, re-echoed through the valleys, and spread terror on every side.

THE MINISTRY OF ANGELS.

AND is there care in heaven, and is there love
In heav'nly spirits to these creatures base,
That may compassion of their evils move?
There is; or else more wretched were the case
Of men than beasts. But oh! the exceeding grace
Of highest God! that loves his creatures so,
And all his works with mercy doth embrace,
That blessed angels he sends to and fro,
To serve to wicked men,—to serve his wicked foe.

How oft do they their silver bowers leave,
To come to succour us that succour want!
How oft do they with golden pinions cleave
The flitting skies, like flying pursuivant,
Against foul fiends to aid us militant!
They for us fight, they watch and duly ward,
And their bright squadrons round about us plant;
And all for love, and nothing for reward:
Oh! why should heav'nly God to man have such regard!

SPENSER.

THE INCARNATION.

FOR thou wast born of woman, thou did'st come,
O Holiest! to this world of sin and gloom,
Not in thy dread omnipotent array;
        And not by thunders strew'd
        Was thy tempestuous road;
Nor indignation burnt before thee on thy way:
But thee, a soft and naked child,
Thy mother, undefiled,
In the rude manger laid to rest
From off her virgin breast.

The heav'ns were not commanded to prepare
A gorgeous canopy of golden air;
Nor stoop'd their lamps th' enthroned fires on high;
        A single silent star
        Came wand'ring from afar,
Gliding uncheck'd and calm along the liquid sky;
The Eastern Sages leading on,
As at a kingly throne,

To lay their gold and odours sweet
Before thy infant feet.

The earth and ocean were not hush'd to hear
Bright harmony from ev'ry starry sphere;
Nor at thy presence brake the voice of song
        From all the cherub choirs,
        And seraph's burning lyres
Pour'd through the host of heav'n the charmed clouds along,
One angel troop the strain began,
Of all the race of man,
By simple shepherds heard alone,
That soft Hosanna's tone.

And when thou didst depart, no car of flame
To bear thee hence in lambent radiance came;
Nor visible angels mourn'd with drooping plumes:
        Nor didst thou mount on high
        From fatal Calvary
With all thine own redeem'd outbursting from their tombs.
For thou didst bear away from earth
But one of human birth,
The dying felon by thy side, to be
In Paradise with thee.

Nor o'er thy cross the clouds of vengeance break,
A little while the conscious earth did shake
At that foul deed by her fierce children done;
        A few dim hours of day,
        The world in darkness lay,
Then bask'd in bright repose beneath the cloudless sun:
While thou didst sleep beneath the tomb,
Consenting to thy doom,
Ere yet the white-robed Angel shone
Upon the sealed stone.

And when thou didst arise, thou didst not stand
With devastation in thy red right hand,
Plaguing the guilty city's murtherous crew;
        But thou didst haste to meet
        Thy mother's coming feet,
And bear the words of peace unto the faithful few:
Then calmly, slowly didst thou rise
Into thy native skies,
Thy human form dissolved on high
In its own radiancy.

MILMAN.

MARKS OF DESIGN IN THE ANIMAL ECONOMY.

The Eye.—Sturmius held, that the examination of the eye was a cure for atheism. Besides that conformity to optical principles which its internal constitution displays, and which alone amounts to a manifestation of intelligence having been exerted in the structure; besides this, which forms no doubt the leading character of the organ, there is to be seen, in every thing belonging to it and about it, an extraordinary degree of care, an anxiety for its preservation, due, if we may so speak, to its value and its tenderness. It is lodged in a strong, deep, bony socket, composed by the junction of seven different bones, hollowed out at their edges. In some few species, as that of the coatimondi, the orbit is not bony throughout; but whenever this is the case, the upper, which is the deficient part, is supplied by a cartilaginous ligament; a substitution which shows the same care. Within this socket it is imbedded in fat, of all animal substances the best adapted both to its repose and motion. It is sheltered by the eyebrows; an arch of hair, which, like a thatched penthouse, prevents the sweat and moisture of the forehead from running down into it.

But it is still better protected by its *lid*. Of the superficial parts of the animal frame, I know none which, in its office and structure, is more deserving of attention than the eyelid. It defends the eye, it wipes it, it closes it in sleep. Are there, in any work of art whatever, purposes more evident than those which this organ fulfils? or an apparatus for executing those purposes more intelligible, more appropriate, or more mechanical? If it be overlooked by the observer of nature, it can only be because it is obvious and familiar. This is a tendency to be guarded against. We pass by the plainest instances, whilst we are exploring those which are rare and curious; by which conduct of the understanding we sometimes neglect the strongest observations, being taken up with others, which, though more recondite and scientific,

are as solid arguments, entitled to much less consideration.

In order to keep the eye moist and clean (which qualities are necessary to its brightness and its use), a wash is constantly supplied by a secretion for the purpose; and the superfluous brine is conveyed to the nose through a perforation in the bone as large as a goose-quill. When once the fluid has entered the nose, it spreads itself upon the inside of the nostril, and is evaporated by the current of warm air, which, in the course of respiration, is continually passing over it. Can any pipe or outlet, for carrying off the waste liquor from a dye-house or a distillery, be more mechanical than this is? It is easily perceived that the eye must want moisture; but could the want of the eye generate the gland which produces the tear, or bore the hole by which it is discharged,—a hole through a bone?

It is observable, that this provision is not found in fish, the element in which they live supplying a constant lotion to the eye.

2. *The Bones in the Human Neck.*—I challenge any man to produce, in the joints and pivots of the most complicated or the most flexible machine that was ever contrived, a construction more artificial, or more evidently artificial, than that which is seen in the vertebræ of the *human neck.*—Two things were to be done. The head was to have the power of bending forward and backward, as in the act of nodding, stooping, looking upward or downward; and, at the same time, of turning itself round upon the body to a certain extent, the quadrant we will say, or rather, perhaps, a hundred and twenty degrees of a circle. For these two purposes, two distinct contrivances are employed: First, the head rests immediately upon the uppermost of the vertebræ, and is united to it by a *hinge*-joint; upon which joint the head plays freely forward and backward, as far either way as is necessary, or as the ligaments allow: which was the first thing required.—But then the rotatory motion is unprovided for: Therefore, secondly, to make the head capable

of this, a farther mechanism is introduced, not between the head and the uppermost bone of the neck, where the hinge is, but between that bone and the next bone underneath it. It is a mechanism resembling a tenon and mortice. This second, or uppermost bone but one, has what anatomists call a process, viz. a projection, somewhat similar, in size and shape, to a tooth; which tooth, entering a corresponding hole or socket in the bone above it, forms a pivot or axle, upon which that upper bone, together with the head which it supports, turns freely in a circle; and as far in the circle as the attached muscles permit the head to turn. Thus are both motions perfect without interfering with each other. When we nod the head, we use the hinge-joint, which lies between the head and the first bone of the neck. When we turn the head round, we see the tenon and mortice, which runs between the first bone of the neck and the second. We see the same contrivance, and the same principle, employed in the frame or mounting of a telescope. It is occasionally requisite that the object-end of the instrument be moved up and down, as well as horizontally, or equatorially. For the vertical motion there is a hinge, upon which the telescope plays; for the horizontal or equatorial motion, an axis upon which the telescope and the hinge turn round together. And this is exactly the mechanism which is applied to the motion of the head: nor will any one here doubt of the existence of counsel and design, except it be by that debility of mind which can trust to its own reasonings in nothing.

We may add, that it was, on another account also, expedient that the motion of the head backward and forward should be performed upon the upper surface of the first vertebra; for, if the first vertebra itself had bent forward, it would have brought the spinal marrow, at the very beginning of its course, upon the point of the tooth.

3. *The Fang of a Viper* is a clear and curious example of mechanical contrivance. It is a perforated tooth, loose at the root; in its quiet state, lying down flat upon the jaw, but furnished with a muscle, which, with a jerk,

and by the pluck, as it were, of a string, suddenly erects it. Under the tooth, close to its root, and communicating with the perforation, lies a small bag containing the venom. When the fang is raised, the closing of the jaw presses its root against the bag underneath; and the force of this compression sends out the fluid with a considerable impetus through the tube in the middle of the tooth. What more unequivocal or effectual apparatus could be devised for the double purpose of at once inflicting the wound and injecting the poison? Yet, though lodged in the mouth, it is so constituted, as, in its inoffensive and quiescent state, not to interfere with the animal's ordinary office of receiving its food. It has been observed also, that none of the harmless serpents, the black snake, the blind worm, &c. have these fangs, but teeth of an equal size; not moveable, as this is, but fixed into the jaw.

4. *The Stomach of the Camel* is well known to retain large quantities of water, and to retain it unchanged for a considerable length of time. This property qualifies it for living in the desert. Let us see, therefore, what is the internal organization, upon which a faculty so rare and so beneficial depends. A number of distinct sacs or bags (in a dromedary thirty of these have been counted), are observed to lie between the membranes of the second stomach, and to open into the stomach near the top by small square apertures. Through these orifices, after the stomach is full, the annexed bags are filled from it; and the water so deposited is, in the first place, not liable to pass into the intestines; in the second place, is kept separate from the solid aliment; and, in the third place, is out of the reach of the digestive action of the stomach, or a mixture with the gastric juice. It appears probable, or rather certain, that the animal, by the conformation of its muscles, possesses the power of squeezing back this water from the adjacent bags into the stomach, whenever *thirst* excites it to put this power in action.

5. *I shall* add one more example, for the sake of its *novelty*. *It is* always an agreeable discovery, when, hav-

ing remarked in an animal an extraordinary structure, we come at length to find out an unexpected use for it. The following narrative furnishes an instance of this kind. The babyrouessa, or Indian hog, a species of wild boar, found in the East Indies, has two *bent* teeth, more than half a yard long, growing upwards, and (which is the singularity) from the upper-jaw. These instruments are not wanted for offence; that service being provided for by two tusks issuing from the upper-jaw, and resembling those of the common boar: nor does the animal use them for defence. They might seem, therefore, to be both a superfluity and an incumbrance. But observe the event:—the animal sleeps standing; and, in order to support its head, hooks its upper-tusks upon the branches of trees.—PALEY.

THE POWER OF GOD.

THOU art, O God, the life and light
  Of all this wond'rous world we see;
Its glow by day, its smile by night,
  Are but reflections caught from Thee!
Where'er we turn, thy glories shine,
And all things fair and bright are Thine.

When day with farewell beam delays
  Among the op'ning clouds of even,
And we can almost think we gaze
  Through golden vistas into heaven,
Those hues that mark the sun's decline,
So soft, so radiant, Lord, are Thine.

When night, with wings of stormy gloom,
  O'ershadows all the earth and skies,
Like some dark beauteous bird, whose plume
  Is sparkling with a thousand eyes,
That sacred gloom, those fires divine,
So grand, so countless, Lord, are Thine.

When youthful spring around us breathes,
  Thy spirit warms her fragrant sigh,
And every flower the summer wreaths,
  Is *born beneath* that kindling eye:
Where'er we turn, thy glories shine,
And all things bright and fair are Thine.—MOORE.

GENERAL PROPERTIES OF BODIES.

Mrs B. Emily.

Mrs B. When I speak of *bodies*, I mean substances, of whatever nature, whether solid or fluid; and *matter* is the general term used to denote the substance, whatever its nature be, of which the different bodies are composed. Thus wood is the matter of which this table is made; water is the matter with which this glass is filled, &c.

E. I am very glad you have explained the meaning of the word matter, as it has corrected an erroneous conception I had formed of it; I thought that it was applicable to solid bodies only.

Mrs B. There are certain properties which appear to be common to all bodies, and are hence called the *essential properties* of bodies; these are, *impenetrability, extension, figure, durability,* and *inertia.* These are called the general properties of bodies, as we do not suppose any body to exist without them.

By impenetrability is meant the property which bodies have of occupying a certain space, so that, where one body is, another cannot be without displacing the former; for two bodies cannot exist in the same place at the same time. A liquid may be more easily removed than a solid body; yet it is not the less substantial, since it is as impossible for a liquid and a solid to occupy the same space at the same time, as for two solid bodies to do so. For instance, if you put a spoon into a glass full of water, the water will flow over to make room for the spoon.

E. I understand this perfectly. Liquids are in reality as substantial or as impenetrable as solid bodies; and they appear less so only because they are more easily displaced.

Mrs B. Air is a fluid differing in its nature from liquids, but no less impenetrable. If I endeavour to *fill this phial* by plunging it into this basin of water, the *air, you see,* rushes out of the phial in bubbles, in order *to make way for* the water; for air and water cannot

exist together in the same space, any more than two hard bodies; and if I reverse this goblet, and plunge it perpendicularly into the water, so that the air will not be able to escape, the water will no longer fill the goblet.

E. But it rises a considerable way into it.

Mrs B. Because the water compresses or squeezes the air into a small space in the upper part of the goblet; but, as long as it remains there, no other body can occupy the same place.

E. A difficulty has just occurred to me with regard to the impenetrability of solid bodies; if a nail is driven into a piece of wood, it penetrates it, and both the wood and the nail occupy the same space that the wood alone did before.

Mrs B. The nail penetrates between the particles of the wood, by forcing them to make way for it; for you know that not a single atom of wood can remain in the space which the nail occupies; and if the wood is not increased in size by the addition of the nail, it is because wood is a porous substance like sponge, the particles of which may be compressed or squeezed closer together, and it is thus that they make way for the nail.

We may now proceed to the next general property of bodies, *extension*. A body which occupies a certain space must necessarily have extension; that is to say, *length, breadth,* and *depth:* these are called the dimensions of extension. Can you form an idea of any body without them?

E. No, certainly I cannot; though these dimensions must, of course, vary extremely in different bodies. The length, breadth, and depth of a box, or of a thimble, are very different from those of a walking-stick or of a hair. But is not height also a dimension of extension?

Mrs B. Height and depth are the same dimension, considered in different points of view. If you measure a body or a space from the top to the bottom, you call it depth; if from the bottom upwards, you call it height: thus the depth and height of a box are in fact the same *thing*.

E. Very true; a moment's consideration would have enabled me to discover that; and breadth and width are also the same dimension.

Mrs B. Yes; the limits of extension constitute *figure* or shape. You conceive that a body having length, breadth, and depth, cannot be without form, either symmetrical or irregular?

E. Undoubtedly; and this property admits of almost an infinite variety.

Mrs B. Nature has assigned regular forms to her productions in general. The natural form of mineral substances is that of crystals, of which there is a great variety. Many of them are very beautiful, and no less remarkable by their transparency or colour, than by the perfect regularity of their forms, as may be seen in the various museums and collections of natural history. The vegetable and animal creations appear less symmetrical, but are still more diversified in figure than the mineral kingdom. Manufactured substances assume the various arbitrary forms which the art of man designs for them; and an infinite number of irregular forms are produced by fractures, and by the dismemberment of the parts of bodies.

E. Such as a piece of broken china or glass.

Mrs B. Or the fragments of mineral bodies which are broken in being dug out of the earth, or decayed by the effects of torrents and other causes. The picturesque effects of rock-scenery is, in a great measure, owing to accidental irregularities of this kind.

We may now proceed to divisibility; that is to say, a susceptibility of being divided into an indefinite number of parts. Take any small quantity of matter,—a grain of sand for instance,—and cut it into two parts; these two parts might be again divided, had we instruments sufficiently fine for the purpose; and if, by means of pounding, grinding, and other similar methods, we carry division to the greatest possible extent, and reduce body to its finest imaginable particles, yet not one of

the particles will be destroyed, and the body will continue to exist, though in this altered state.

E. I have heard that a single pound of wool may be spun so fine as to extend to nearly 100 miles in length; this appears to me a very remarkable instance of the power of divisibility.

Mrs B. It is certainly. The melting of a solid body in a liquid also affords a very striking example of the extreme divisibility of matter. When you sweeten a cup of tea, for instance, with what minuteness the sugar must be divided to be diffused throughout the whole of the liquid!

E. And if you pour a few drops of red wine into a glass of water, they immediately tinge the whole of the water, and must therefore be diffused throughout it.

Mrs B. Exactly so; and the perfume of this lavender-water will be almost as instantaneously diffused throughout the room, if I take out the stopper.

E. But in this case it is only the perfume of the lavender, and not the water itself, that is diffused in the room.

Mrs B. The odour or smell of a body is part of the body itself, and is produced by very minute particles or exhalations which escape from odoriferous bodies. It would be impossible that you should smell the lavender-water, if particles of it did not come in actual contact with your nose.

E. But when I smell a flower, I see no vapour rise from it, and yet I can smell it at a considerable distance.

Mrs B. You could, I assure you, no more smell a flower, the odoriferous particles of which did not touch your nose, than you could taste a fruit, the flavoured particles of which did not come in contact with your tongue.

E. That is wonderful indeed; the particles, then, which exhale from the flower, and from the lavender-water, are, I suppose, too small to be visible?

Mrs B. Certainly; you may form some idea of their extreme minuteness from the immense number which must have escaped in order to perfume the whole room;

and yet there is no sensible diminution of the liquid in the phial.

E. But the quantity must really be diminished?

Mrs B. Undoubtedly; and were you to leave the bottle open a sufficient length of time, the whole of the liquid would evaporate and disappear. But though so minutely subdivided as to be imperceptible to any of our senses, each particle would continue to exist; for it is not within the power of man to destroy a single particle of matter; nor is there any reason to suppose that in nature an atom is ever annihilated.

E. Yet, when a body is burnt to ashes, part of it, at least, appears to be effectually destroyed. Look how small is the residue of ashes beneath the grate from all the coals which have been consumed within it!

Mrs B. That part of the coals which you suppose to be destroyed evaporates in the form of smoke, whilst the remainder is reduced to ashes. A body, in burning, undergoes, no doubt, many remarkable changes;—it is generally subdivided;—its form and colour are altered;—its extension increased;—but the various parts, into which it has been separated by combustion, continue in existence, and retain all the essential properties of bodies.

E. But that part of a burnt body which evaporates in smoke has no figure; smoke, it is true, ascends in columns into the air, but it is soon so much diffused as to lose all form; it becomes indeed invisible.

Mrs B. Invisible, I allow; but we must not imagine that what we no longer see no longer exists. Were every particle of matter that becomes invisible annihilated, the world itself would, in the course of time, be destroyed. The particles of smoke, when diffused in the air, continue still to be particles of matter, as well as when more closely united in the form of coals. They are really as substantial in the one state as in the other, and equally so when, by their extreme subdivision, they become invisible. No particle of matter is ever destroyed; this is a principle you must constantly remember. Every thing in nature decays and corrupts in the lapse of time. We

die, and our bodies moulder to dust, but not a single atom of them is lost; they serve to nourish the earth, whence, while living, they drew their support.

The remaining essential property of matter is called *inertia;* this word expresses the resistance which inactive matter makes to a change of state. Bodies appear, not only to be incapable of changing their actual state, whether it be of motion or of rest, but to be endowed with a *power of resisting* such a change. You know that it requires force to put a body, which is at rest, in motion; an exertion of strength is also requisite to stop a body which is already in motion. The resistance of the body to a change of state, in either case, is called *inertia.*

E. In playing at base-ball, I am obliged to use all my strength to give a rapid motion to the ball; and when I have to catch it, I am sure I feel the resistance it makes to being stopped; but if I did not catch it, it would soon fall to the ground, and stop of itself.

Mrs B. Inert matter is as incapable of stopping of itself as it is of putting itself into motion. When the ball ceases to move, therefore, it must be stopped by some other cause or power; but as it is one with which you are yet unacquainted, we cannot at present investigate its effects. MRS MARCET.

ON THE DOWNFAL OF POLAND.

OH! sacred Truth! thy triumph ceased a while,
And Hope, thy sister, ceased with thee to smile,
When leagued Oppression pour'd to Northern wars
Her whisker'd pandoors and her fierce hussars,
Waved her dread standard to the breeze of morn,
Peal'd her loud drum, and twang'd her trumpet horn;
Tumultuous horror brooded o'er her van,
Presaging wrath to Poland—and to man!

Warsaw's last champion, from her height survey'd,
Wide o'er the fields, a waste of ruin laid,—
Oh! *Heaven! he cried,*—my bleeding country save!
Is there no hand on high to shield the brave?

Yet, though destruction sweep those lovely plains,
Rise, fellow-men! our country yet remains!
By that dread name, we wave the sword on high!
And swear for her to live!—with her to die!

He said, and on the rampart-heights array'd
His trusty warriors, few, but undismay'd;
Firm-paced and slow, a horrid front they form,
Still as the breeze, but dreadful as the storm;
Low, murm'ring sounds along their banners fly,
Revenge, or death,—the watch-word and reply;
Then peal'd the notes, omnipotent to charm,
And the loud tocsin toll'd their last alarm!

In vain, alas! in vain, ye gallant few!
From rank to rank your volley'd thunder flew:—
Oh! bloodiest picture in the book of time,
Sarmatia fell, unwept, without a crime;
Found not a generous friend, a pitying foe,
Strength in her arms, nor mercy in her woe!
Dropp'd from her nerveless grasp the shatter'd spear,
Closed her bright eye, and curb'd her high career:—
Hope, for a season, bade the world farewell,
And freedom shriek'd—as KOSCIUSKO fell!

The sun went down, nor ceased the carnage there,
Tumultuous murder shook the midnight air—
On Prague's proud arch the fires of ruin glow,
His blood-dyed waters murm'ring far below;
The storm prevails, the rampart yields a way,
Bursts the wild cry of horror and dismay!
Hark! as the smouldering piles with thunder fall,
A thousand shrieks for hopeless mercy call!
Earth shook—red meteors flash'd along the sky,
And conscious Nature shudder'd at the cry!

Departed spirits of the mighty dead!
Ye that at Marathon and Leuctra bled!
Friends of the world! restore your swords to man,
Fight in his sacred cause, and lead the van!
Yet for Sarmatia's tears of blood atone,
And make her arm puissant as your own!
! once again to Freedom's cause return
patriot TELL—the BRUCE of BANNOCKBURN!

CAMPBELL.

SECTION II.

HOW IT STRIKES A STRANGER.

In a remote period of antiquity, when the marvellous obtained a readier credence than now, it was fabled that a stranger of extraordinary appearance was observed pacing the streets of one of the magnificent cities of the East, remarking, with an eye of intelligent curiosity, every surrounding object. Several individuals gathering around him, questioned him concerning his country and his business; but they presently perceived that he was unacquainted with their language, and he soon discovered himself to be equally ignorant of the most common usages of society. At the same time, the dignity and intelligence of his air and demeanour forbade the idea of his being either a barbarian or a lunatic. When at length he understood by their signs that they wished to be informed whence he came, he pointed with great significance to the sky; upon which the crowd, concluding him to be one of their deities, were proceeding to pay him divine honour: but he no sooner comprehended their design, than he rejected it with horror; and, bending his knees and raising his hands towards heaven in the attitude of prayer, gave them to understand that he also was a worshipper of the powers above.

After a time, it is said, that the mysterious stranger accepted the hospitalities of one of the nobles of the city; under whose roof he applied himself with great diligence to the acquirement of the language, in which he made such surprising proficiency, that in a few days he was able to hold intelligent intercourse with those around him. The noble host now resolved to take an early opportunity of *satisfying his curiosity respecting the country and quality of his guest*; and, upon his expressing

...together unacquainted with the manners and ... products and privileges of your country, yet ... I cannot but congratulate you on your arrival in ...ld; especially since it has been your good fortune ... on a part of it affording such various sources of ...nt as this our opulent and luxurious city. And ...red, it will be my pride and pleasure to introduce ...all that is most worthy the attention of such a ...ished foreigner."

...adventurer, accordingly, was presently initiated ... arts of luxury and pleasure which were there ...nderstood. He was introduced, by his obliging ... their public games and festivals, to their ... diversions and convivial assemblies; and he was ...ginning to be in some measure reconciled to the ... and customs of our planet, strangely as they ...d from those of his own, when an incident occurred ... gave an entirely new direction to his energies.

...was but a few weeks after his arrival on our earth, ... walking in the cool of the day with his friend in ...utskirts of the city, his attention was arrested by ...ppearance of a spacious enclosure near which they ...d. He inquired the use to which it was appropri...

...It is," replied the nobleman, "a place of public in...ent."

"I do not understand you," said the stranger.

"It is the place," repeated his friend, "where we ...ry our dead."

"Excuse ... replied his companion, with some embarrass... ...t trouble you to explain yourself yet furthe...

The ... ...ted the information in still plainer terms.

"I ... ...ss to comprehend you perfectly," said ... ...rning deadly pale. "This must re...late ... ...f which I was not only totally ig... ...ld, but of which I have, as yet, ...ours. I pray you, therefore, to ...

this desire, the stranger assured him that he would answer his inquiries that evening after sunset. Accordingly, as night approached, he led him forth upon the balconies of the palace, which overlooked the wealthy and populous city. Innumerable lights from its busy streets and splendid palaces were now reflected in the dark bosom of its noble river; where stately vessels, laden with rich merchandise from all parts of the known world, lay anchored in the port. This was a city in which the voice of the harp and of the viol, and the sound of the millstone, were continually heard; and craftsmen of all kinds of craft were there; and the light of a candle was seen in every dwelling; and the voice of the bridegroom and the voice of the bride were heard there. The stranger mused a while upon the glittering scene, and listened to the confused murmur of mingling sounds. Then suddenly raising his eyes to the starry firmament, he fixed them, with an expressive gaze, on the beautiful evening star, which was just sinking behind a dark grove that surrounded one of the principal temples of the city. "Marvel not," said he to his host, "that I gaze with fond affection on yonder silvery star. That was my home; yes, I was lately an inhabitant of that tranquil planet; from whence a vain curiosity has tempted me to wander. Often had I beheld with admiration this brilliant world of yours, ever one of the brightest gems of our firmament; and the ardent desire I had long felt to know something of its condition was at length unexpectedly gratified. I received permission and power from above to traverse the mighty void, and to direct my course to this distant sphere. To that permission, however, one condition was annexed, to which my eagerness for the enterprise induced me hastily to consent; namely, that I must thenceforth remain an inhabitant of this strange earth, and undergo all the vicissitudes to which its natives are subject. Tell me therefore, I pray you, what is the lot of man; and explain to me more fully than I yet understand, all that I hear and see around me."

"Truly, Sir," replied the astonished noble, "although

I am altogether unacquainted with the manners and customs, products and privileges of your country, yet, methinks, I cannot but congratulate you on your arrival in our world; especially since it has been your good fortune to alight on a part of it affording such various sources of enjoyment as this our opulent and luxurious city. And be assured, it will be my pride and pleasure to introduce you to all that is most worthy the attention of such a distinguished foreigner."

Our adventurer, accordingly, was presently initiated in those arts of luxury and pleasure which were there well understood. He was introduced, by his obliging host, to their public games and festivals, to their theatrical diversions and convivial assemblies; and he was just beginning to be in some measure reconciled to the manners and customs of our planet, strangely as they differed from those of his own, when an incident occurred which gave an entirely new direction to his energies.

It was but a few weeks after his arrival on our earth, when, walking in the cool of the day with his friend in the outskirts of the city, his attention was arrested by the appearance of a spacious enclosure near which they passed. He inquired the use to which it was appropriated.

"It is," replied the nobleman, "a place of public interment."

"I do not understand you," said the stranger.

"It is the place," repeated his friend, "where we bury our dead."

"Excuse me, Sir," replied his companion, with some embarrassment, "I must trouble you to explain yourself yet further."

The nobleman repeated the information in still plainer terms.

"I am still at a loss to comprehend you perfectly," said the stranger, turning deadly pale. "This must relate to something of which I was not only totally ignorant in my own world, but of which I have, as yet, had no intimation *in yours*. I pray you, therefore, to satisfy

my curiosity; for, if I have any clue to your meaning, this surely is a matter of more mighty concernment than any to which you have hitherto directed me."

"My good friend," replied the nobleman, "you must be indeed a novice amongst us, if you have yet to learn, that we must all, sooner or later, submit to take our place in these dismal abodes; nor will I deny that it is one of the least desirable of the circumstances which appertain to our condition; for which reason it is a matter rarely referred to in polished society, and this accounts for your being hitherto uninformed on the subject. But truly, Sir, if the inhabitants of the place whence you came are not liable to any similar misfortune, I advise you to betake yourself back again with all speed; for be assured there is no escape here; nor could I guarantee your safety for a single hour."

"Alas," replied the adventurer, "I must submit to the conditions of my enterprise, of which, till now, I little understood the import. But explain to me, I beseech you, something more of the nature and consequences of this wondrous metamorphosis, and tell me at what period it most commonly happens to man."

While he thus spoke, his voice faltered, and his whole frame shook violently; his countenance was pale as death, and a cold dew stood in large drops upon his forehead.

His companion, finding the discourse becoming more serious than was agreeable, declared that he must refer him to the priests for further information, this subject being very much out of his province.

"How! exclaimed the stranger, "then I cannot have understood you;—do the priests only die?—are not you to die also?"

His friend evading these questions, hastily conducted his importunate companion to one of their magnificent temples, where he gladly consigned him to the instructions of the priesthood.

The emotion which the stranger had betrayed when he received the first idea of death was yet slight in comparison with that which he experienced, as soon

as he gathered from the discourses of the priests some notion of immortality, and of the alternative of happiness or misery in a future state. But this agony of mind was exchanged for transport when he learned, that, by the performance of certain conditions before death, the state of happiness might be secured. His eagerness to learn the nature of these terms excited the surprise and even the contempt of his sacred teachers. They advised him to remain satisfied for the present with the instructions he had received, and to defer the remainder of the discussion till the morrow.

"How!" exclaimed the novice, "say you not that death may come at any hour?—may it not then come this hour?—and what if it should come before I have performed these conditions! Oh! withhold not this excellent knowledge from me a single moment!"

The priests then proceeded to explain their Theology to their attentive auditor; but who shall describe the ecstacy of his happiness when he was given to understand that the required conditions were, generally, of easy and pleasant performance; and that the occasional difficulties or inconveniences which might attend them, would entirely cease with the short term of his earthly existence!

From that period, continues the legend, the stranger devoted himself to the performance of those conditions, on which, he was told, his future welfare depended; but, by thus devoting his chief attention to his chief interests, he excited the surprise, the contempt, and even the enmity of most of the inhabitants of the city; and they rarely mentioned him but with a term of reproach, which has been variously rendered in all the modern languages.

Nothing could equal the stranger's surprise at this circumstance; as well as that of his fellow-citizens appearing, generally, so extremely indifferent as they did to their own interests. That they should have so little prudence and forethought, as to provide only for their necessities and pleasures for that short part of their existence in which they were to remain in this planet, he could consider only as the effect of disordered intellect; so that

he even returned their incivilities to himself with affectionate expostulation, accompanied by lively emotions of compassion and amazement.

If ever he was tempted for a moment to violate any of the conditions of his future happiness, he bewailed his own madness with agonizing emotions; and to all the invitations he received from others to do any thing inconsistent with his real interests, he had but one answer,—"Oh," he would say, "I am to die!—I am to die!"

JANE TAYLOR.

SONG OF THE GREEK BARD.

THE isles of Greece, the isles of Greece!
  Where burning Sappho loved and sung,
Where grew the arts of war and peace,—
  Where Delos rose, and Phœbus sprung!
Eternal summer gilds them yet,
But all, except their sun, is set.

The Scian and the Teian muse,
  The hero's harp, the lover's lute,
Have found the fame your shores refuse;
  Their place of birth alone is mute
To sounds which echo further west
Than your sires' "Island of the Blest."

The mountains look on Marathon—
  And Marathon looks on the sea;
And, musing there an hour alone,
  I dream'd that Greece might still be free;
For, standing on the Persian's grave,
I could not deem myself a slave.

A king sate on the rocky brow
  Which looks o'er sea-born Salamis;
And ships, by thousands, lay below,
  And men in nations;—all were his!
He counted them at break of day—
And when the sun set where were they?

And where are they? and where art thou,
  My country? On thy voiceless shore

The heroic lay is tuneless now—
  The heroic bosom beats no more!
And must thy lyre, so long divine,
Degenerate into hands like mine!

'Tis something, in the dearth of fame,
  Though link'd among a fetter'd race,
To feel at least a patriot's shame,
  Even as I sing, suffuse my face;
For what is left the poet here?
For Greeks a blush—for Greece a tear.

Must *we* but weep o'er days more blest?
  Must *we* but blush?—Our fathers bled.
Earth! render back from out thy breast
  A remnant of our Spartan dead;
Of the three hundred grant but three,
To make a new Thermopylæ!

What, silent still! and silent all?
  Ah! no;—the voices of the dead
Sound like a distant torrent's fall,
  And answer, "Let one living head,
But one arise—we come, we come!"
'Tis but the living who are dumb.

In vain—in vain: strike other chords;
  Fill high the cup with Samian wine!
Leave battles to the Turkish hordes,
  And shed the blood of Scio's vine!
Hark! rising to the ignoble call—
How answers each bold bacchanal!

You have the Pyrrhic dance as yet,
  Where is the Pyrrhic phalanx gone?
Of two such lessons, why forget
  The nobler and the manlier one?
You have the letters Cadmus gave—
Think ye he meant them for a slave?

Fill high the bowl with Samian wine!
  We will not think of themes like these;
It made Anacreon's song divine:
  He served—but served Polycrates—
A *tyrant; but our masters* then
Were still, at least, our countrymen.

The tyrant of the Chersonese
    Was freedom's best and bravest friend;
That tyrant was Miltiades!
    O! that the present hour would lend
Another despot of the kind!
Such chains as his were sure to bind.

Fill high the bowl with Samian wine!
    On Suli's rock, and Parga's shore,
Exists the remnant of a line
    Such as the Doric mothers bore;
And there, perhaps, some seed is sown,
The Heracleidan blood might own.

Trust not for freedom to the Franks—
    They have a king who buys and sells;
In native swords, and native ranks,
    The only hope of courage dwells;
But Turkish force, and Latin fraud,
Would break your shields, however broad.

Fill high the bowl with Samian wine!
    Our virgins dance beneath the shade—
I see their glorious black eyes shine;
    But gazing on each glowing maid,
My own the burning tear-drop laves,
To think such breasts must suckle slaves.

Place me on Sunium's marbled steep,—
    Where nothing, save the waves and I,
May hear our mutual murmurs sweep;
    There, swan-like, let me sing and die;
A land of slaves shall ne'er be mine—
Dash down the cup of Samian wine!

BYRON.

THE MALLEABLE METALS.

METALS, in a perfect state, are easily distinguished from other minerals, by a peculiar brilliancy which pervades their whole substance, by their complete opacity, and their great weight in proportion to that of other mineral substances. When found in a state of combination with *other substances,* they have the name of *ores,* and they *are in general* deposited in veins of various thickness, and

at various depths in the earth. The mode of obtaining them is to penetrate from the surface of the earth to the vein, and there to follow it, in whatever direction it may lie. The hollow places thus formed are called *mines*, and the men employed in them are denominated *miners*. When the veins are at a great depth, or extend to any considerable distance beneath the surface of the earth, it is necessary, at intervals, to make openings, or *shafts*, to the surface, for the admission and circulation of the air; and also to draw off the water which collects at the bottom, by drains, pumps, or steam-engines, as the situation or circumstances require. After the metallic ores are drawn from the mine, they, in general, go through several processes before they are in a state fit for use. Some of them are first washed in running water, to clear them from earthy particles. They are then piled with combustible substances, and burnt or roasted, for the purpose of ridding them of the sulphur or arsenic with which they may happen to be combined, and which rises from them in a state of fume or smoke. Thus, having been freed from impurities, they undergo the operation of smelting, in furnaces constructed according to the nature of the respective metals, or the uses to which they are to be subsequently applied.—The principal of the *malleable metals*, that is, those metals which are capable of being flattened or elongated by the hammer, without tearing or breaking, are *platina*, *gold*, *mercury*, *silver*, *copper*, *iron*, *tin*, and *lead*.

Platina, the most ponderous of the metals, is, when purified, about twenty times heavier than water. It is of a white colour, but not so bright as silver, and is found only in small grains in the sands of some of the rivers in South America. If platina could be obtained in sufficient quantity, it would perhaps be the most valuable of all metals. The important uses to which it is applicable may easily be imagined when we state that it is nearly as hard as iron, that the most intense fire and most powerful acids have scarcely any effect upon it, and that it is not *fusible by the heat of a forge*, but requires either the con-

centrated rays of the sun in a burning mirror, the galvanic electricity, or a flame produced by the agency of oxygen gas. It is made into mirrors for reflecting telescopes, into mathematical instruments, pendulums, and clock-work; particularly where it is requisite that the construction of these should be more than usually correct, as platina is not only free from liability to rust, but is likewise subject to very little dilatation by heat. This extraordinary metal was unknown in Europe until about the year 1735, when it was first brought from South America by Don Antonio Ulloa.

Gold is a metal distinguished by its yellow colour, by its being next in weight to platina, softer than silver, more hard than tin, and more easily melted than copper. It is found in various states, massive, in grains, and in small branches. It cannot be dissolved in any acid except that called aqua regia, and it is more than nineteen times heavier than water. The countries of hot climates are those chiefly in which gold is discovered. It abounds in the sands of many African rivers, and is very common in several districts both of South America and India. The gold-mines of Lima and Peru have had great celebrity; but it is from Brazil that the greatest part of the gold which is seen in commerce is brought. The annual produce of the various gold-mines in America has been estimated at nearly 9,500,000*l.* sterling. The principal gold-mines in Europe are those of Hungary, and next to them those of Saltsburg. In Spain considerable mines were worked, particularly in the province of Asturia, previous to the discovery of America. Gold has been found also in Sweden and Norway, and in several parts of Ireland. Among the sands of a mountain-stream in the county of Wicklow pieces have been discovered which weighed twenty-two ounces; and it is said that lumps of large size have been used as weights in some of the common shops, and that others have been placed to keep open the doors of cottages and houses in some parts of Ireland, the owners not knowing what they were. Gold is also occasionally found in Cornwall, and some other counties

of England. It is asserted that, at the marriage of James V. there were covered dishes filled with coins made of Scottish gold, and that a portion of these was presented to each of the guests by way of dessert. Very extensive operations for the discovery of gold were carried on during the reign of Queen Elizabeth, at Leadhills, in Lanarkshire, under the direction of an Englishman of the name of Bulmer; and the trenches, the heaps of soil that were turned up, and other marks of these operations, are yet visible near the road between Leadhills and Elvanfoot. The mode of extracting gold from its ore is by reducing it into a fine powder, and mixing this powder with quicksilver. The latter having the quality of uniting with itself every particle of the precious metal, but being incapable of union with the other substances, extracts it even from the largest portions of earth. The quicksilver, which has absorbed the gold, is then separated by means of heat; it flies off in vapour, and leaves the other metal in the vessel used for the operation. Gold has been known and in request from the very earliest ages of the world. By the assent of civilized nations, it has become the representative of wealth under the form of money; and it is now an universal circulating medium for the purchase of all kinds of commodities. It has been chosen to occupy this important place on account of its scarcity, its weight, and other valuable properties. Beyond its use in the coinage, its most important uses are for goldsmiths' work, in jewellery, and for gilding. In each of these its standard or purity is different. That denominated *coinage*, or *sterling gold*, consists of an alloy of about twenty-two parts of gold with two parts of copper; whilst gold of the *new standard*, of which gold-plate, watch-cases, and many other articles are made, consists of only eighteen parts of gold, and six parts of copper. Each of these is stamped at Goldsmiths' Hall; the former with a lion, a leopard's head (the mark of the goldsmiths' company), a letter denoting the year, the king's head, and the manufacturer's initials; the latter is stamped with the king's head, letter for the year, a

crown, the number 18 to designate its quality, and the manufacturer's initials. The coinage gold of Portugal and America is of the same standard as our own; that of France is somewhat inferior; and Spanish gold is inferior to the French. The Dutch ducats and some of the Moorish coins are of gold unalloyed. *Trinket gold,* which is unstamped, is in general much less pure than any of the above; and the *pale gold* which is used by jewellers is an alloy of gold with silver. The ductility and tenacity of this metal, particularly when alloyed with copper, are extremely remarkable, and are fully proved by the great extent to which a very small quantity of it may be beaten into leaves, or drawn into wire. Leaves of gold may be beaten so thin, that a single grain may be made into fifty-six leaves, each an inch square. These leaves are only $\frac{1}{282000}$ of an inch thick; and the gold leaf which is used to cover silver wire is but the twelfth part of that thickness. An ounce of gold upon silver wire is capable of being extended more than 1300 miles in length; and sixteen ounces of gold, which, in the form of a cube, would not measure more than an inch and a quarter on each side, will completely gild a silver wire in length sufficient to compass the whole earth like a hoop.

Mercury, in its native state, is called quicksilver, and is found in small globules of shining, silvery appearance, scattered through different kinds of stones, clay, and ores. It is nearly fourteen times heavier than water. The principal ore of mercury, and that from which the metal is chiefly obtained, is *cinnabar.* This is of a red colour, and consists of mercury mineralized with sulphur. It is sometimes found in a massive state, sometimes in grains, and sometimes crystallized; and chiefly among rocks of the coal-formation. The most productive mines of cinnabar are in the Palatinate in Germany, at Idria in Carniola, and at Almaden in Spain. Those of Idria are supposed to be more valuable than any of the others. Their first discovery, which was more than three hundred years ago, was made in a very extraordinary manner.

This part of the country was then much inhabited by coopers; and one of the men, on retiring from work in the evening, placed a new tub under a dropping spring, to try if it would hold water; and, when he came in the morning, he found it so heavy that he could scarcely move it. Examining into the cause of this extraordinary circumstance, the man observed that it was owing to a shining and ponderous fluid which was at the bottom. The affair was noised abroad, and a society of persons was formed to search further, and discover the mine from which this quicksilver had flowed. Such was their success, that the reigning Duke of Austria paid them a compensation for the discovery, and took the mine into his own possession. The greatest perpendicular depth of this mine is now more than 830 feet. It is descended by buckets, or by ladders placed obliquely in a zigzag direction. In some parts of the mine the pure metal flows in small streams, so that in six hours a man has been known to collect more than thirty-six pounds weight of it. In other parts it is found in a multitude of little drops, either in ores or in clay. The whole produce of the mine is said to exceed a hundred tons weight of mercury per annum. The mode of extracting it from *cinnabar* is said to be by mixing this ore either with pounded chalk, or with half its weight of iron filings, and distilling it in a stoneware retort. By this process the sulphur combines with the iron, and the mercury, in a state of purity, passes into the receiver. It is the singular property of this metal, which has no other alliance whatever with silver than its appearance, to be capable of division, by the least effort, into an indefinite number of particles, each of which assumes a spherical form; and to be always in a fluid state in the common temperature of our atmosphere. Even during the most intense frost, it still retains its fluidity. By the effect, however, of extreme cold, artificially produced, mercury becomes a solid metal, and in this state may be beaten with a hammer and extended without break*ing*; but care must be taken that *it does not touch the fingers*, as it would blister them and

cause unpleasant sores, in the same manner as any burning substance. Being the heaviest of all fluids of which we have any knowledge, and not congealing in the temperature of our climate, it has been preferred, before all others, for barometers, as a measure of the weight of the atmosphere. And, as heat dilates mercury similarly to other fluids, it is likewise made into thermometers.

Silver is a white, brilliant, sonorous, and ductile metal, somewhat more than ten times heavier than water. It is found in different states. Of these the principal is denominated *native* silver, from its being nearly in a state of purity. Native silver sometimes occurs in small lumps, sometimes in a crystallized form, and sometimes in leaves, threads, or wire. In many instances the latter are so connected with each other as to resemble the branches of trees, in which case the ore is called *dendritic*. There are also several ores of silver, in which this metal is combined with lead, antimony, arsenic, sulphur, and other substances. The silver that is produced from the mines of Potosi, in South America, is of the dendritic kind; and is considered by the Spaniards as the purest that is known. A range of mountains near Potosi, about twenty miles in circumference, is said to be perforated by more than 300 shafts, or openings of mines, and to produce, in the whole, from 30,000 to 40,000 dollars worth of ore per week. The annual produce of all the silver-mines in America has been estimated at near 2,400,000*l.* sterling. Silver is also found in several parts of Europe; and, some years ago, there were mines of this metal, worked to a great extent, at Konigsberg in Norway. Specimens of native silver are not uncommon from some of the copper-mines of Cornwall; and, many years ago, a vein of silver ore was wrought in the parish of Alva, Stirlingshire, Scotland, from which, it is said, about 40,000*l.* worth of silver was obtained before the repository was exhausted. Different methods are employed, in different countries, to extract silver from its ore. In Mexico and Peru the mineral is pounded, roasted, washed, and then mixed with mercury in vessels filled with water; a mill

being employed for the more perfectly agitating and mingling them. By this process the silver combines with the mercury. The alloy thus obtained, after undergoing some further processes, is submitted to the action of heat, by which the mercury passes off in a state of vapour, leaving the silver behind. The silver is then melted and cast into bars or ingots. In other countries, after the earthy matters are cleared from the silver-ore by pounding and washing, the remainder is melted with lead; which, by a subsequent process, is separated, and leaves the silver alone and pure. This metal ranks next in value to gold. Like gold, it is coined into money, and is manufactured into various kinds of utensils, such as goblets, vases, spoons, and dishes, which have the general appellation of *silver plate.* For all these purposes it is alloyed with copper, which does not affect its whiteness, and is not easily detected, unless it be in too great proportion; the intention of this is to render it harder than it would otherwise be, and thereby the better to adapt it to receive fine and sharp impressions on being cast. Our *standard silver* is composed of somewhat more than 12¼ parts of pure metal and one part of copper; and the metal of this standard is used, both for silver plate and in the coinage. The mark or stamp which is given to it at Goldsmiths' Hall is similar to that which has been explained for sterling gold. Silver is nearly as ductile as gold. It may be beaten into leaves so thin that a single grain in weight will cover a space of more than fifty-one inches; and it may be drawn into wire much finer than a human hair, indeed so fine that a single grain of silver has, in this form, been extended nearly to the length of 400 feet. It is this wire gilded that has the name of gold wire; and what is denominated *gold lace* is but flattened silver thread gilt, twisted round silk, and woven.

The same Subject continued.

Copper is a red or orange-coloured metal, about nine *times heavier than water.* It is the most sonorous of all

metals, and, except iron, the most elastic. It is found under a great variety of forms, sometimes in masses of pure metal, but more frequently in combination with other substances, particularly sulphur. There are valuable copper-mines in every quarter of the world; and the use of copper is probably of greater antiquity than that of any other metal. It is mentioned in the Old Testament; and, at a very early period, domestic utensils and instruments of war were made of bronze, or a compound of copper and tin. Even during the Trojan war, as we learn from Homer, the combatants had no other armour than what was made of bronze. The Greek and Roman sculptors are said to have executed fine works of art in porphyry, granite, and other hard minerals, by means of copper instruments; whence historians have been induced to believe that the ancients possessed the secret of rendering this metal as hard as steel. Copper is very abundant in several parts of Great Britain, particularly in the island of Anglesea. The copper-mines of Anglesea are situated on the top of a mountain, and form an enormous cavity more than 500 yards long, 100 yards broad, and 100 yards deep. The ore is got from the mine by pick-axes, and blasting with gunpowder. It is then broken with hammers into small pieces, an operation which is chiefly performed by women and children. After this it is piled into kilns of great length, and each about six feet high; from the upper parts of which flues are attached that communicate with what are called sulphur-chambers. The kilns are closely covered; and fires are lighted in different parts, that the ore may undergo the process of roasting. The whole mass gradually kindles, and the sulphur, which is combined with the ore, is expelled in fumes, by the heat, and is conveyed through the flues to the sulphur-chamber. This process occupies from three to ten months, according to the size of the kilns; and, during that period, the sulphur-chamber is cleared four or five times. When the operation is complete, or the ore is freed from the sulphur, it is taken to places denominated the slacking-pits. It is subsequently

conveyed to the smelting-houses, where, by intense heat, the pure metal is drawn off in a fluid state.

The uses of copper are numerous and important. When rolled into sheets, betwixt large iron cylinders, it is employed for the covering of houses, sheathing the bottoms of ships, and other purposes. As a covering for houses, copper is lighter than slate, but whether it be more durable has not been yet ascertained. The coppering of ships tends to facilitate their progress through the water, by presenting a smoother surface than that of wood, and not permitting shell-animals to fasten to it as they do to wood. It likewise preserves the bottoms of the ships from being punctured by marine-worms; and consequently secures to them a longer duration than they would otherwise have. Plates of copper are also used by artists for engraving pictures upon, either by cutting them with a sharp steel instrument, or corroding them with aquafortis, in lines drawn by a needle through a thin coat of wax spread upon their surface; and this metal likewise is manufactured into various kinds of cooking utensils. Great care, however, ought to be taken, that acid liquors, or even water intended for drinking, or to be mixed with food, be not suffered to stand long in such vessels, otherwise they will dissolve so much of the metal as to give them disagreeable and even poisonous qualities. All vessels formed of this metal, which are employed in cookery, ought to have their inner surface covered with a coat of tin.—Of all metals, copper is the most susceptible of alloy.

Prince's Metal, or *Pinchbeck*, is an alloy containing three parts of zinc and four of copper.

Bronze, and *the metal of which cannons are made*, consist of from six to twelve parts of tin combined with 100 parts of copper.

Bell-Metal, or the metal of which bells are formed, is usually composed of three parts of copper and one of tin.

Malachite is a solid green copper-ore, the surface of which has frequently a bubbled appearance, and the interior is marked with numerous irregular zones, and lay-

ers of different shades of green. It is somewhat more than three times as heavy as water, and is so soft as to be easily scratched by a knife.

Iron is a metal of a livid greyish colour, hard and elastic, and capable of receiving a high polish. Its weight is nearly eight times as great as that of water. Of all the metals there are none which, on the whole, are so useful, or are so copiously and variously dispersed as iron. Indeed, its value is beyond all estimate,—infinitely greater than even that of gold. By means of it the earth has been cultivated and subdued; and without it, houses, cities, and ships, could not have been built, the arts practised, science advanced, or man civilized. Its uses were ascertained at a very early period of the world. Moses speaks of furnaces for iron, and of the ores from which it was extracted, and tells us that swords, knives, axes, and instruments for cutting stones, were, in his time, all made of this metal. The most considerable iron-mines at present existing are those in Great Britain and France. After iron-ore is dug out of the earth, it is crushed or broken into small pieces by machinery. It is next washed, to detach the grosser particles of earth which adhere to it. This operation ended, it is roasted in kilns formed for the purpose, by which the sulphur, and some other substances that are capable of being separated by heat, are detached. It is then thrown into a furnace, mixed with a certain portion of limestone and charcoal, to be melted. Near the bottom of the furnace there is a tap-hole, through which the liquid metal is discharged into furrows made in a bed of sand. The larger masses, or those which flow into the main furrow, are called *sows;* the smaller ones are denominated *pigs* of iron; and the general name of the metal in this state is *cast iron.* With us iron is employed in three states,—of cast iron, wrought iron, and steel.

Cast iron is distinguishable by its properties of being, in general, so hard as to resist both the hammer and the file; being extremely brittle, and, for the most part, of a dark-grey or blackish colour; and a great number of useful

and important articles are formed of it, such as grates, chimney-backs, pots, boilers, pipes, and cannon-shot; all of which are made by casting ladles-full of the liquid metal into moulds that are shaped for the purpose in sifted sand. The process of converting cast iron into *wrought* or *malleable iron* is called *blooming*. The cast iron is thrown into the furnace, and kept melted by the flame of combustibles which is made to play upon its surface. Here it is suffered to continue for about two hours, a workman constantly stirring it, until, notwithstanding the continuance of the heat, it gradually acquires consistency, and congeals. It is then taken out while hot, and violently beaten with a large hammer worked by machinery. In this state it is formed into bars for sale.

Steel is usually made by a process called *cementation*. This consists in keeping bars of iron in contact with powdered charcoal, during a state of ignition, for several hours, in earthen troughs or crucibles, the mouths of which are stopped up with clay. Steel, if heated to redness, and suffered to cool slowly, becomes soft; but if plunged, whilst hot, into cold water, it acquires extreme hardness. It may be rendered so hard as even to scratch glass, and at the same time it becomes more brittle and elastic than it was before. Although thus hardened, it may have its softness and ductility restored, by being again heated, and suffered to cool slowly. A piece of polished steel, in heating, assumes first a straw-yellow colour, then a lighter yellow, next becomes purple, then violet, then red, next deep blue, and last of all bright blue. At this period it becomes red hot, the colours disappear, and metallic scales are formed upon, and incrust its surface. All these different shades of colour indicate the different tempers that the steel acquires by the increase of heat, from that which renders it proper for files, to that which fits it for the manufacture of watch-springs. Mr Stoddart has availed himself of this property to give to surgical and other cutting instruments, those degrees of temper which their various uses require. All kinds of edge-tools, where excellence is required, are made of

steel; and a steel instrument may be immediately known from an iron one, by letting fall upon it a drop of aqua-fortis somewhat diluted with water. If it be steel, this will occasion a black spot; but if it be iron, it will not have this effect.

Meteoric Stones and *Loadstone* are species of iron-ore.

Tin is a white metal, somewhat like silver in appearance, but it is considerably lighter, and makes a crackling noise when bent. It is very soft and ductile, has but little elasticity, and is about seven times as heavy as water. The principal tin-mines which are known to us are those of Cornwall, Devonshire, Germany; the island of Banca, and peninsula of Malacca, in India; and Chili and Mexico in America. Of these the most celebrated are the mines of Cornwall, which are known to have been worked before the commencement of the Christian era. When the tin-ore has been dug from the earth, it is thrown into heaps, and broken to pieces. After this it is washed, and subsequently roasted in an intense heat, for the purpose of dissipating some of the substances with which it is combined. It is lastly melted in a furnace, and thereby reduced to a metallic state. The metal is then poured into quadrangular moulds of stone, each containing about 320 pounds weight. These have the denomination of *block-tin*, and are stamped by officers of the Duke of Cornwall, with the impression of a lion, the arms of that duchy. This is rendered a necessary operation before the tin can be offered for sale; and on stamping, it pays a duty of four shillings per hundred weight to the Prince of Wales as Duke of Cornwall, who thence derives a very considerable income.

The article usually called *tin*, or *tin-plate*, and in Scotland, *white iron*, of which saucepans, boilers, drinking vessels, and other utensils of domestic economy are made, consists only of thin iron-plate coated with tin. It is thus formed:—The iron plates are immersed in water rendered slightly acid by spirit of salt or spirit of vitriol; after which, to clean them completely, they are scoured quite bright. These plates are then each dipped into a

vessel filled with melted tin, the surface of which is covered with suet, pitch, or resin, to prevent the formation of dross upon it. The tin not only covers the surface of the iron, but completely penetrates it, giving to its whole substance a white colour.

Iron is usually tinned before, but copper always after it has been formed into utensils. The object to be attained by the tinning of copper is to prevent the vessels made of that metal from being corroded, and to preserve the food prepared in them from being mixed with any particles of that poisonous substance called verdigris, which is formed by such corrosion.

Lead is a heavy metal, of pale and livid grey colour when broken, not sonorous when pure, very flexible, and so soft that it may be marked with the nail. It stains paper or the fingers of a bluish colour, and is about eleven times heavier than water.

The most common state in which lead is found is in combination with sulphur and a small portion of silver. This ore is known by the name of *galena*, and is frequently in the form of blackish cubical crystals. Great Britain possesses the most important lead-mines in the world; and those that are best known are in the counties of Flint and Derby in England, and in Lanarkshire in Scotland. When the ore is brought out of the mine, it is sorted and washed, to free it from dirt and rubbish. After this it is spread on a board; the best pieces are picked out and separated; and those containing ore mixed with spar or other substances, are placed separate, to be broken, and again picked. After the ore, by picking and washing, has been sufficiently cleansed from extraneous matters, it is roasted in a kind of kiln to free it from the sulphur that is combined with it. The next process is to mix it with a certain quantity of coke, charcoal, or peat, and submit it to the smelting-furnace. In this furnace there are tap-holes which, when the lead is melted, are opened, and the metal, in a fluid state, runs into a large iron pan. The dross which floats on its surface is now skimmed off; and the metal is taken out by

ladles, and poured into cast-iron moulds, with round ends. The lead thus formed is ready for use, and has the name of *pig-lead*. According to their size, the pieces that are thus cast have the appellation of *pigs* and *half-pigs*. Lead is much employed in the useful arts. When rolled between iron cylinders to a requisite state of thinness and uniformity, it is used for the covering of houses and churches, notwithstanding the danger, in case of fire, to persons within, who are exposed to a shower of burning metal. It is cast into pipes, cisterns, and reservoirs for water, as well as into large boilers for chemical purposes. But all culinary or domestic vessels made of lead, particularly if intended for the keeping of acid liquors, should carefully be avoided, as the surface of the lead is thereby corroded, and the liquid contained in them is rendered poisonous. Hence arises that dreadful complaint, too well known where cider is kept in leaden cisterns, called the *Devonshire cholic*; hence also the injury which sometimes follows from the use of lead in glazing of coarse earthenware.

Great quantities of lead are also consumed for the making of *shot*. For this purpose the metal is alloyed with arsenic, to render it more brittle, and to render the grains more round and perfect than they otherwise would be. Shot is formed by dropping the melted alloy into water, through an iron or copper frame, perforated with round holes, according to the size required. For the smallest shot the elevation is about ten feet above the water, and for the largest about a hundred and fifty feet.

Abridged from BINGLEY'S *Useful Knowledge*.

DETACHED SELECTIONS FROM SHAKSPEARE.

HEAVEN doth with us as we with torches do;
Not light them for themselves: for if our virtues
Did not go forth of us, 'twere all alike
As if we had them not. Spirits are not finely touch'd,
But to fine issues. Nature never lends
The smallest scruple of her excellence;

But, like a thrifty goddess, she determines
Herself the glory of a creditor,
Both thanks and use.

Now, by two-headed Janus,
Nature hath framed strange fellows in her time:
Some that will evermore peep through their eyes,
And laugh, like parrots, at a bagpiper;
And other of such vinegar aspect,
That they'll not show their teeth in way of smile,
Though Nestor swear the jest be laughable.

The quality of mercy is not strain'd;
It droppeth, as the gentle rain from heaven,
Upon the place beneath: it is twice bless'd;
It blesseth him that gives, and him that takes:
'Tis mightiest in the mightiest; it becomes
The throned monarch better than his crown:
His sceptre shows the force of temporal power,
The attribute to awe and majesty,
Wherein doth sit the dread and fear of kings;
But mercy is above this scepter'd sway;
It is enthroned in the hearts of kings;
It is an attribute to God himself:
And earthly power doth then show likest God's,
When mercy seasons justice.

How sweet the moonlight sleeps upon this bank!
Here will we sit, and let the sounds of music
Creep in our ears; soft stillness, and the night,
Become the touches of sweet harmony.

'Tis the mind that makes the body rich;
And as the sun breaks through the darkest clouds,
So honour peereth in the meanest habit.
What! is the jay more precious than the lark,
Because his feathers are more beautiful?
Or is the adder better than the eel,
Because his painted skin contents the eye?
O, no, good Kate; neither art thou the worse
For this poor furniture and mean array.

HEAR him but reason in divinity,
And, all-admiring, with an inward wish
You would desire the king were made a prelate:
Hear him debate of commonwealth affairs,
You would say,—it hath been all-in-all his study:
List his discourse of war, and you shall hear
A fearful battle render'd you in music:
Turn him to any cause of policy,
The Gordian knot of it he will unloose,
Familiar as his garter; that, when he speaks,
The air, a charter'd libertine, is still,
And the mute wonder lurketh in men's ears,
To steal his sweet and honey'd sentences.

So may he rest; his faults lie gently on him!
Yet thus far, Griffith, give me leave to speak him,
And yet with charity,—He was a man
Of an unbounded stomach, ever ranking
Himself with princes; one that by suggestion
Tied all the kingdom: simony was fair play;
His own opinion was his law: i' the presence
He would say untruths; and be ever double,
Both in his words and meaning: he was never,
But where he meant to ruin, pitiful:
His promises were, as he then was, mighty;
But his performance, as he is now, nothing.
Of his own body he was ill, and gave
The clergy ill example.
Grif. Noble madam,
Men's evil manners live in brass; their virtues
We write in water.
This cardinal,
Though from an humble stock, undoubtedly
Was fashion'd to much honour. From his cradle
He was a scholar, and a ripe and good one;
Exceeding wise, fair spoken, and persuading;
Lofty and sour to them that loved him not;
But, to those men that sought him, sweet as summer.
And though he were unsatisfied in getting
(Which was a sin), yet in bestowing, madam,
He was most princely. Ever witness for him

Those twins of learning that he raised in you,
Ipswich and Oxford! one of which fell with him,
Unwilling to outlive the good that did it;
The other, though unfinish'd, yet so famous,
So excellent in art, and still so rising,
That Christendom shall ever speak his virtue.
His overthrow heap'd happiness upon him;
For then, and not till then, he felt himself,
And found the blessedness of being little:
And, to add greater honours to his age
Than man could give him, he died fearing God.

MISCELLANEOUS EXTRACTS FROM TRAVELLERS IN THE NORTH OF EUROPE.

1.—*Winter Evening of an Iceland Family.*

A WINTER EVENING in an Icelandic family presents a scene in the highest degree interesting and pleasing. Between three and four o'clock the lamp is hung up in the *badstofa*, or principal apartment, which answers the double purpose of a bedchamber and sitting-room; and all the members of the family take their station, with their work in their hands, on their respective beds, all of which face each other. The master and mistress, together with the children, or other relations, occupy the beds at the inner end of the room; the rest are filled by the servants.

The work is no sooner begun, than one of the family, selected on purpose, advances to a seat near the lamp, and commences the evening lecture, which generally consists of some old saga, or such other histories as are to be obtained on the island. Being but badly supplied with printed books, the Icelanders are under the necessity of copying such as they can get the loan of, which sufficiently accounts for the fact, that most of them write a hand equal in beauty to that of the ablest writing-masters in other parts of Europe. Some specimens of their Gothic writing are scarcely inferior to copperplate. The reader is frequently interrupted, either by the head, or

some of the more intelligent members of the family, who make remarks on various parts of the story, and propose questions, with a view to exercise the ingenuity of the children and servants. In some houses, the sagas are repeated by such as have got them by heart; and instances are not uncommon, of itinerant historians, who gain a livelihood during the winter, by staying at different farms till they have exhausted their stock of literary knowledge. At the conclusion of the evening labours, which are frequently continued till near midnight, the family join in singing a psalm or two; after which a chapter from some book of devotion is read, if the family be not in possession of a bible; but where this sacred book exists, it is preferred to every other. A prayer is also read by the head of the family, and the exercise concludes with a psalm. Their morning devotions are conducted in a similar manner at the lamp. When the Icelander awakes, he does not salute any person that may have slept in the room with him, but hastens to the door, and, lifting up his eyes towards heaven, adores Him who made the heavens and the earth, the author and preserver of his being, and the source of every blessing. He then returns into the house, and salutes every one he meets, with "God grant you a good day." DR HENDERSON.

2.—*A Winter Landscape in Russia.*

NOTHING interesting presenting itself, we travelled onwards, through towns and villages, and over a dreary country, rendered ten thousand times more so by the season. All around was a vast wintry flat; and frequently not a vestige of man or of cultivation was seen, not even a solitary tree, to break the boundless expanse of snow. Indeed, no idea can be formed of the immense plains we traversed, unless you imagine yourself at sea, far, far from the sight of land. The Arabian deserts cannot be more awful to the eye, than the appearance of this scene. Such is the general aspect of the country during the rigours of winter, with now and then an exception of a

large forest skirting the horizon for a considerable length of way. At intervals, as you shoot along, you see openings amongst its lofty trees, from which emerge picturesque groups of natives and their one-horse sledges, whereon are placed the different articles of commerce, going to various parts of this empire. They travel in vast numbers, and from all quarters, seldom fewer than one hundred and fifty in a string, having a driver to every seventh horse. The effect of this cavalcade at a distance is very curious; and in a morning, as they advance towards you, the scene is as beautiful as striking. The sun then rising, throws his rays across the snow, transforming it to the sight into a surface of diamonds. From the cold of the night every man and horse is incrusted with these frosty particles; and, the beams falling on them too, seem to cover their rude faces and rugged habits with a tissue of the most dazzling brilliants. The manes of the horses, and the long beards of the men, from the quantity of congealed breath, have a particularly glittering effect.

SIR R. K. PORTER.

3.—*Russian Dwarfs and Fools.*

DWARFS and fools are here (in Moscow) the pages and the playthings of the great, and, at almost all entertainments, stand for hours by their lord's chair, holding his snuff-box, or awaiting his commands. There is scarcely a nobleman in this country who is not possessed of one or more of these freaks of nature; but in their selection I cannot say that the *noblesse* display their gallantry, as they choose none but males. These little beings are generally the gayest dressed persons in the service of their lord, and are attired in a uniform or livery of very costly materials. In the presence of their owner, their usual station is at his elbow, in the character of a page; and, during his absence, they are then responsible for the cleanliness and combed locks of their companions of the canine species. Besides these lilliputians, many of the *nobility keep a fool* or two, like the motleys of our court

in the days of Elizabeth; but like in name alone: for their wit, if they ever had any, is swallowed up by indolence. Savoury sauce and rich repasts swell their bodies to the most disgusting size; and, lying about in the corners of some splendid saloon, they sleep profoundly, till awakened by the command of their lord to amuse the company. Shaking their enormous bulk, they rise from their trance; and, supporting their unwieldy trunks against the wall, drawl out their heavy nonsense with as much grace as the motions of a sloth in the hands of a reptile-fancier. One glance was sufficient for me of these imbruted creatures; and, with something like pleasure, I turned from them to the less humiliating view of human nature in the dwarf. The race of these unfortunates is very diminutive in Russia, and very numerous. They are generally well-shaped, and their hands and feet particularly graceful. Indeed, in the proportion of their figures, we should nowhere discover them to be flaws in the economy of nature, were it not for a peculiarity of feature, and the size of the head, which is commonly exceedingly enlarged. Take them on the whole, they are such compact, and even pretty little beings, that no idea can be formed of them from the clumsy deformed dwarfs which are exhibited at our fairs in England. I cannot say that we need envy Russia this part of her offspring.

Sir R. K. Porter.

4.—*Holstein Nightingales.*

To a person coming at once from England, the appearances are new and strange; but that which offered the greatest novelty to our party was the loud and incessant chorus of myriads of frogs, the whole way from Lubeck to Eutin. To call it croaking would convey a very erroneous idea of it, because it is really harmonious; and we gave to these reptiles the name of *Holstein Nightingales*. Those who have not heard it would hardly believe it to be possible for any number of frogs to produce such a powerful and predominating clamour. The effect

of it, however, is certainly not displeasing; especially after sunset, when all the rest of animated nature is silent, and seems to be at rest. The noise of any one of them singly, as we sometimes heard it near the road, was, as usual, disagreeable, and might be compared to the loudest quacking of a duck; but when, as it generally happened, tens of thousands, nay millions, sang together, it was a choral vibration, varied only by cadences of sound, something like those produced upon musical glasses; and it accorded with the uniformity which twilight cast over the woods and waters. DR E. D. CLARKE.

5.—*Moscow.*

WE arrived at the season of the year in which this city is most interesting to strangers. Moscow is in every thing extraordinary; as well in disappointing expectation as in surpassing it; in causing wonder and derision, pleasure and regret. Let me conduct the reader back with me again to the gate by which we entered, and thence through the streets. Numerous spires, glittering with gold, amidst burnished domes, and painted palaces, appear in the midst of an open plain, for several versts before you reach this gate. Having passed, you look about, and wonder what has become of the city, or where you are, and are ready to ask, once more, How far is it to Moscow? They will tell you, "This is Moscow!" and you behold nothing but a wide and scattered suburb, huts, gardens, pigsties, brick-walls, churches, dunghills, palaces, timber-yards, warehouses, and a refuse, as it were, of materials sufficient to stock an empire with miserable towns and miserable villages. One might imagine all the states of Europe and Asia had sent a building, by way of representative, to Moscow; and under this impression the eye is presented with deputies from all countries, holding congress: timber-huts from regions beyond the Arctic; plastered palaces from Sweden and Denmark, not whitewashed since their arrival; painted *walls from the Tyrol;* mosques from Constantinople;

Tartar temples from Bucharia; pagodas, pavilions, and virandas, from China; cabarets from Spain; dungeons, prisons, and public offices from France; architectural ruins from Rome; terraces and trellisses from Naples; and warehouses from Wapping.

Having heard accounts of its immense population, you wander through deserted streets. Passing suddenly towards the quarter where the shops are situated, you might walk upon the heads of thousands. The daily throng is there so immense, that, unable to force a passage through it, or assign any motive that might convene such a multitude, you ask the cause, and are told that it is always the same. Nor is the costume less various than the aspect of the buildings; Greeks, Turks, Tartars, Cossacks, Chinese, Muscovites, English, French, Italians, Poles, Germans, all parade in the habits of their respective countries. DR E. D. CLARKE.

6.—*Banishment to Siberia.*

THE nature of a journey to Siberia is exceedingly misunderstood in this country, and by the world in general. Such a decree of banishment presents to our minds the picture of every thing that is deplorable in the lot of humanity—separation from home, and friends, and beloved pursuits—transportation to a bleak, dismal, and savage region—the exchange of comforts and luxuries for all that is most comfortless and wretched. When viewed a little nearer, this picture has no such frightful aspect; and a man must both see what the Russian leaves, and have a detailed account of what he is doomed to in his new residence, to estimate fairly the extent of the sacrifice which the caprice of his tyrant may, at any moment, and without any reason, compel him to undergo. Now, Dr Clarke represents the Russians as by no means strongly attached to their native soil. The life which they love to lead is so brutal and sensual, in every respect, that its gratifications may be obtained in one part of the world as easily as in another. Besides, from the number and rank

of the exiles, Tobolski has become a large and populous city, enriched with shops,—full of what, in Russia, must be deemed good society—adorned with theatres, with private assemblies, and with places of public resort. We there meet with booksellers—masquerades—French hotels. The wines of France, and the malt liquors of England, may be had there, as at Petersburg or Moscow. The gaiety of the place is extolled by all who have, either as soldiers or exiles, been forced to visit it; provisions are so cheap, that, about fifty years ago, Gmelin found it possible for a person to live on ten roubles (about two pounds) a year.

It is no wonder that an officer of considerable rank in the Russian service should have told Dr Clarke, that he would rather have half his pay, and live at Tobolski, than the whole of it, and reside at St Petersburg; and that many of the exiles, after being ordered home, have anxiously sought to return thither. These particulars may correct our notions of the horrors attending a sentence of expulsion to Siberia; but, let it at the same time be remembered, that the desert has only been cultivated, and made to smile, by the wanton excess to which the Russian despots have carried their power; and that the phenomenon of a city tolerably populous and civilized, in the heart of Siberia, 1500 miles from Petersburg, is as monstrous and unnatural a thing as the parent from whence it sprang—the tyranny which reigns at Petersburg itself—the boundless tyranny which outraged nature, by planting that city in the marshes of the Neva—and which profanes it still more, by stunting the shoots of human happiness there, and in every other quarter of that enslaved empire.

THE BURIAL OF SIR JOHN MOORE.

Not a drum was heard, nor a funeral-note,
As his corpse to the ramparts we hurried;
Not a soldier discharged his farewell shot,
O'er the grave where our hero we buried.

We buried him darkly at dead of night,
The sods with our bayonets turning;
By the struggling moonbeam's misty light,
And the lantern dimly burning.

No useless coffin enclosed his breast,
Nor in sheet nor in shroud we bound him,
But he lay like a warrior taking his rest,
With his martial cloak around him.

Few and short were the prayers we said,
And we spoke not a word of sorrow,
But we steadfastly gazed on the face of the dead,
And we bitterly thought of the morrow.

We thought as we hollow'd his narrow bed,
And smooth'd down his lonely pillow,
That the foe and the stranger would tread o'er his head,
And we far away on the billow.

Lightly they'll talk of the spirit that's gone,
And o'er his cold ashes upbraid him,
But nothing he'll reck if they let him sleep on
In the grave where a Briton has laid him.

But half of our heavy task was done,
When the clock toll'd the hour for retiring,
And we heard by the distant and random gun,
That the foe was suddenly firing.

Slowly and sadly we laid him down,
From the field of his fame fresh and gory,
We carved not a line, we raised not a stone,
But we left him alone with his glory.

REV. C. WOLFE—*Remains.*

ATTRACTION OF COHESION AND ATTRACTION OF GRAVITY.

Mrs B., Emily, Caroline.

E. I have related to my sister, Caroline, all that you taught me yesterday respecting bodies; and she has been so much delighted by it, that she hopes you will have the goodness to admit her to your lessons.

Mrs B. Very willingly; but I did not think that you had any taste for studies of this nature, Caroline?

C. I confess, Mrs B., that hitherto I had formed no very agreeable idea either of philosophy or philosophers; but what Emily has told me has excited my curiosity so much, that I shall be highly pleased if you will allow me to become one of your pupils.

Mrs B. I fear that I shall not find you so tractable a pupil as Emily; I know that you are much biassed in favour of your own opinions.

C. Then you will have the greater merit in reforming them; and, after all the wonders that Emily has related to me, I think I stand little chance against you and your attractions.

Mrs B. Well, your objections I shall willingly admit, as they will be the means of elucidating the subject. Emily, do you recollect the names of the general properties of bodies?

E. Impenetrability, extension, figure, divisibility, and inertia.

Mrs B. Very well. You must remember that these are properties common to all bodies, and of which they cannot be deprived; all other properties are called *accidental,* because they depend on the relation of one body to another.

C. Yet, surely, Mrs B., there are other properties which are essential to bodies besides those you have enumerated. Colour and weight, for instance, are common to all bodies, and do not arise from their connexion with each other, but exist in the bodies themselves.

Mrs B. I beg your pardon; these properties do not exist in bodies independently of their connexion with other bodies.

C. What; have bodies no weight! Does not this table weigh heavier than this book? and if one thing weighs heavier than another, must there not be such a thing as weight?

Mrs B. No doubt; but this property does not appear to be essential to bodies; it depends upon their connexion with each other. *Weight* is an effect of the power of *Attraction, without which* the table and the book would

have no weight whatever. Indeed, attraction itself must be considered as an accidental property of matter.

E. I think I understand you: is it not the attraction of gravity which makes bodies heavy?

Mrs B. You are right. The attraction of gravity is proportioned to the quantity of matter contained in bodies. Now, the earth consisting of a much greater quantity of matter than any body upon its surface, the force of its attraction must necessarily be greatest, and must draw every thing towards it, in consequence of which, bodies that are unsupported fall to the ground, whilst those that are supported press upon the object that prevents their fall with a weight equal to the force with which they gravitate towards the earth; so that the same cause which occasions the fall of bodies produces also their weight.

C. But what is attraction, Mrs B.? I do not clearly understand it.

E. Allow me, Mrs B., to explain it to Caroline? All bodies consist of infinitely small particles of matter, each of which possesses the power of attracting, or drawing towards it, any other particle sufficiently near to be within the influence of its attraction; but in minute particles this power extends to so very small a distance that its effect is not sensible, unless they are (or appear to be) in contact. It then makes them stick or adhere together, and is hence called the *attraction of cohesion.* Without this power solid bodies would fall to pieces, or rather crumble to atoms.

C. Well; it never occurred to me that any power was requisite to unite the particles of which solid bodies are composed. But the attraction of cohesion does not, I suppose, exist in liquids; for the particles of liquids do not remain together so as to form a body, unless confined in a vessel?

E. I beg your pardon; it is the attraction of cohesion which holds this drop of water suspended at the end of inger, and keeps the minute watery particles of which composed united. But, as this power is stronger in rtion as the particles of bodies are more closely

united, the cohesive attraction of solid bodies is much greater than that of fluids. The thinner and lighter a fluid is, the less is the cohesive attraction of its particles, because they are farther apart; in air, for example, which is a very light and rare fluid, there is almost no attraction among the particles.

C. It is then, I suppose, owing to the different degrees of attraction of different substances that they are hard or soft, and that liquids are thick or thin?

E. Yes. Is it not so, Mrs B.?

Mrs B. Certainly; but you should express your meaning better by the term *density*, which denotes the closeness and compactness of the particles of a body. *Rarity* is used in the same way, though opposed to *density*; thus, you would say, mercury was a very *dense* fluid, ether a very *rare* one.

C. But you were speaking a little ago of the *attraction of gravity*. Is this the same as the attraction Emily has just described?

Mrs B. It is substantially the same; and had you not interrupted your sister, she would have gone on to describe it also. Explain it now, Emily.

E. The attraction of cohesion takes place between bodies only when they are at such very small distances from each other, that they appear to the eye to be in contact; but the attraction of *gravitation* or *gravity* is the force which all the masses of matter exert upon each other at all distances.

C. You astonish me; surely you do not mean to say that large bodies attract each other.

Mrs B. Indeed she does, Caroline; let us take, for example, the largest bodies in nature, and observe whether they do not attract other bodies. What is it that occasions the fall of this book when I no longer support it?

C. Can it be the attraction of the earth? I thought that all bodies had a natural tendency to fall.

Mrs B. They have a natural tendency to fall, it is true; but that tendency is produced entirely by the *attraction of the earth*; the earth being so much larger

than any body on its surface, forces every body, which is not supported, to fall upon it. All matter is attractive, from the smallest particle to the largest mass, and bodies attract each other with a force proportioned to the quantity of matter they contain.

E. Is it not then because every particle is endowed with an attractive power that large bodies, consisting of a great number of particles, are so strongly attractive?

Mrs B. It is; but there is this difference between the attraction of particles and that of masses, that the former is stronger than the latter in proportion to the quantity of matter. It is from this circumstance that all solid bodies are enabled, by the force of the cohesive attraction of their particles, to resist that of gravity, which would otherwise disunite them, and bring them to a level with the ground, as it does in the case of liquids, which is not sufficient to enable them to resist the power of gravity.

E. And some solid bodies appear to be of this nature, as sand and powder, for instance. Is there no attraction of cohesion between their particles?

Mrs B. Every grain of sand is composed of a great number of other more minute particles, firmly united by the attraction of cohesion; but among the separate grains there is no sensible attraction, because they are not in sufficiently close contact.

E. But, Mrs B., if the attraction of gravity belongs equally to all kinds of matter, it must be mutual between two bodies; and if so, when a stone falls to the earth, the earth should rise part of the way to meet the stone?

Mrs B. Certainly; but you must recollect that the force of attraction is proportioned to the quantity of matter which bodies contain; and if you consider the difference there is, in that respect, between a stone and the earth, you will not be surprised that you do not perceive the earth rise to meet the stone; for, though it is true that a mutual attraction takes place between the earth and the stone, that of the latter is so very small as to render its effect insensible.

E. But since attraction is proportioned to the quantity of matter which bodies contain, why do not the hills attract the houses and churches towards them?

C. Oh, Emily, what an idea! How can the houses and churches be removed when they are so firmly fixed in the ground?

Mrs B. Emily's question is not absurd; and your answer, Caroline, is perfectly just; but can you tell us why the houses and churches are so firmly fixed in the ground?

C. I am afraid I have answered right by mere chance, for I begin to suspect that bricklayers and carpenters could give but little stability to their buildings without the aid of attraction.

Mrs B. It is certainly the cohesive attraction between the bricks and the mortar which enables them to build walls; and these are so strongly attracted by the earth as to resist every other impulse. They would necessarily move towards the hills and the mountains, did not the lesser force yield to the greater. There are, however, some circumstances in which the attraction of a large body has sensibly counteracted that of the earth. If, whilst standing on the declivity of a mountain, you hold a plumb-line in your hand, the weight will not fall perpendicular to the ground, but incline a little toward the mountain.

E. But the size of a mountain is very trifling compared to the whole earth.

Mrs B. Attraction, you must recollect, diminishes with distance; and, in the example of the plumb-line, the weight is considerably nearer to the mountain than to the centre of the earth; then the inclination of the plumb-line is very small, so small that it is not sensible to the eye without the help of instruments contrived for the purpose.

C. Pray, Mrs B., do the two scales of a balance hang parallel to each other?

Mrs B. You mean, I suppose, in other words, to inquire whether two lines, which are perpendicular to the

earth, are parallel to each other? I believe I guess the reason of your question; but I wish you would endeavour to answer it without my assistance.

C. I was thinking that such lines must both tend by gravity to the same point, the centre of the earth; now lines tending to the same point cannot be parallel, as parallels are always at an equal distance from each other, and would never meet.

Mrs B. Very well explained. Lines which fall perpendicular to the surface of a sphere cannot be parallel, because they would all meet if prolonged to the centre of the sphere.

E. And yet a pair of scales, hanging perpendicular to the earth, appear parallel?

Mrs B. Because the sphere is so large, and the scales consequently converge so little, that their inclination is not perceptible to our senses.

The same Subject continued.

C. The reason that a heavy body falls quicker than a light one is, I suppose, because the earth attracts it more strongly?

Mrs B. The earth, it is true, attracts a heavy body more than a light one; but that would not make the one fall quicker than the other.

C. Yet, since it is attraction that occasions the fall of bodies, surely the more a body is attracted the more rapidly it will fall. Besides, experience proves it to be so. Do we not every day see heavy bodies fall quickly, and light bodies slowly.

E. It strikes me, as it does Caroline, that as attraction is proportioned to the quantity of matter, the earth must necessarily attract a body which contains a great quantity more strongly, and therefore bring it to the ground sooner, than one consisting of a smaller quantity.

Mrs B. You must consider, that if heavy bodies are *attracted more* strongly than light ones, they require *more attraction* to make them fall. Remember that

bodies have no natural tendency to fall any more than to rise, or to move laterally, and that they will not fall unless impelled by some force; now this force must be proportioned to the quantity of matter it has to move. A body consisting of 1000 particles of matter, for instance, requires ten times as much attraction to bring it to the ground in the same space of time as a body consisting of only 100 particles.

C. I do not understand that; for it seems to me, that the heavier a body is, the more easily and readily it falls.

E. I think I now comprehend it; let me try if I can explain it to Caroline. Suppose that I draw towards me two weighty bodies, the one of 100, the other of 1000 lbs. weight, must I not exert ten times as much strength to draw the larger one to me, in the same space of time, as is required for the smaller one? And if the earth draws a body of 1000 lbs. weight to it in the same space of time that it draws a body of 100 lbs., does it not follow that it attracts the body of 1000 lbs. weight with ten times the force that it does that of 100 lbs.?

C. I comprehend your reasoning perfectly; but if it were so, the body of 1000 lbs. weight, and that of 100 lbs. would fall with the same rapidity; and the consequence would be, that all bodies, whether light or heavy, being at an equal distance from the ground, would fall to it in the same space of time. Now it is very evident that this conclusion is absurd; experience every instant contradicts it: observe how much sooner this book reaches the floor than this sheet of paper, when I let them drop together.

E. That is an objection I cannot answer. I must refer it to you, Mrs B.

Mrs B. I trust that we shall not find it insurmountable. It is true that, according to the laws of attraction, all bodies at an equal distance from the earth should fall to it in the same space of time, and this would actually take place if no obstacle intervened to impede their fall; but bodies fall through the air, and it is the resistance of

the air which makes bodies of different densities fall with different degrees of velocity.

E. True, they must all force their way through the air, but dense heavy bodies overcome this obstacle more easily than rarer and lighter ones.

C. But the resistance which air opposes to the fall of bodies must be proportioned to their size, not to their weight; for the air being inert, cannot exert a greater force to support the weight of a cannon-ball, than it does to support the weight of a ball of leather of the same size: and since without air the two balls would fall to the ground in the same space of time, I should have supposed that receiving each an equal support from the air, their fall would have been equally retarded, and that they would have reached the ground together.

Mrs B. No; that would happen if the air offered a resistance to the two balls proportioned to their weight instead of to their size; for the cannon-ball contains perhaps 100 times more matter than the leather ball, and consequently would require 100 times more resistance to impede its fall equally.

C. O yes; every particle of matter of the cannon-ball should receive the same support from the air which the particles of the leathern ball receive, in order to retard their descent equally, and make the heavy ball fall as slowly as the light one.

E. The larger the surface of a body then the more air it covers, and the greater is the resistance it meets with from it.

Mrs B. Certainly; observe the manner in which this sheet of paper falls; it floats a while in the air, and then gently descends to the ground. I will roll the same piece of paper up into a ball; it offers now but a small surface to the air, and encounters therefore but little resistance; see how much more rapidly it falls. The heaviest bodies may be made to float a while in the air, by making the extent of their surface counterbalance their *weight*. Here is some gold, one of the most dense bodies

we are acquainted with; but it has been beaten into a very thin leaf, and offers so great an extent of surface in proportion to its weight, that its fall, you see, is still more retarded by the resistance of the air than that of the sheet of paper.

E. But, Mrs B., if the air is a real body, is it not also subjected to the laws of gravity?

Mrs B. Undoubtedly.

E. Then why does it not, like all other bodies, fall to the ground?

Mrs B. The fact is, that it actually does, since the lower stratum of the atmosphere is really in contact with the earth; but the strata above do not fall because they are supported: the particles of air which are nearest to the ground support those that are above, just as the water at the bottom of a basin supports that which is at the surface. The only difference is, that air is a very *elastic fluid,* and consequently has the peculiar property of resuming, after compression, its original dimensions; and you must consider the air of which the atmosphere is composed, as existing in a state of compression; for its particles, being drawn towards the earth by gravity, are brought closer together than they would otherwise be, but the spring or elasticity of the air, by which it endeavours to resist compression, gives it a constant tendency to expand itself.

E. The air then is, I suppose, thicker, or I should rather say more dense, near the surface of the earth, than in the higher regions of the atmosphere; for that part of the air which is nearer the surface of the earth must be most strongly attracted.

Mrs B. The diminution of the force of gravity, at so small a distance as that to which the atmosphere extends, is very inconsiderable; but the weight of the upper parts of the atmosphere resting on those beneath, renders the air near the surface of the earth much more dense than the upper regions. The pressure of the atmosphere has been compared *to that of* a pile of fleeces of wool, in which *the lower fleeces* are pressed together by the weight of

those above; these lie light and loose, in proportion as they approach the uppermost fleece, which receives no external pressure, and is confined merely by the force of its own gravity.

E. It has just occurred to me, that there are some bodies which do not gravitate towards the earth. Smoke and steam, for instance, rise instead of falling.

Mrs B. It is still gravity which produces their ascent; at least, were that power destroyed, these bodies would not rise.

E. I shall be out of conceit with gravity, if it is so inconsistent in its operations.

Mrs B. There is no difficulty in reconciling this apparent inconsistency of effect. The air near the earth is heavier than smoke, steam, or other vapours; it consequently not only supports these light bodies, but forces them to rise, till they reach a part of the atmosphere, the weight of which is not greater than their own, and then they remain stationary. Look at this basin of water; why does the piece of cork which I throw into it float on the surface?

E. Because, being lighter than the water, it is supported by it.

Mrs B. And now, that I pour more water into the basin, why does the cork rise?

E. The water, being heavier than the cork, gets beneath it, and obliges it to rise.

Mrs B. In a similar manner are smoke and vapour forced upwards by the air; but these bodies do not, like the cork, ascend to the surface of the fluid, because, as we observed before, the air being thinner and lighter as it is more distant from the earth, vapours rise only till they attain a region of air of their own density. Smoke, indeed, ascends but a very little way; it consists of minute particles of fuel carried up by a current of heated air from the fire below. Heat, you recollect, expands all bodies; it consequently rarefies air, and renders it lighter than the colder air of the atmosphere: the heated air *from the fire* carries up with it vapour and small particles

of the combustible materials which are burning in the fire. When this current of hot air is cooled by mixing with that of the atmosphere, the minute particles of coal or other combustible fall, and it is this which produces the small black flakes which render the air, and every thing in contact with it, in London so dirty.

E. You must, however, allow me to make one more objection to the universal gravity of bodies; it is the ascent of air-balloons, the materials of which are undoubtedly heavier than air: how, therefore, can they be supported by it?

Mrs B. I admit that the materials of which balloons are made are heavier than the air; but the air with which they are filled is an elastic fluid, of a different nature from the atmospheric air, and considerably lighter; so that, on the whole, the balloon is lighter than the air which it displaces, and consequently will rise on the same principle as smoke and vapour. Now, Emily, let me hear if you can explain how the gravity of bodies is modified by the effect of the air?

E. The air forces bodies which are lighter than itself to ascend; those that are of an equal weight will remain stationary in it; and those that are heavier will descend through it: but the air will have some effect on these last; for if they are not much heavier, they will with difficulty overcome the resistance they meet with in passing through it, they will be borne up by it, and their fall will be more or less retarded.—*Abridged from "Conversations on Natural Philosophy."*

SECTION III.

VERSES WRITTEN IN THE CHURCH-YARD OF RICHMO

METHINKS it is good to be here,
If thou wilt let us build—but for whom?
Nor Elias nor Moses appear,
But the shadows of eve that encompass the gloom,
The abode of the dead, and the place of the tomb.

Shall we build to ambition? Ah! no:
Affrighted he shrinketh away;
For see! they would pin him below
To a small narrow cave, and begirt with cold clay,
To the meanest of reptiles a peer and a prey.

To beauty? Ah! no; she forgets
The charms that she wielded before:
Nor knows the foul worm that he frets
The skin which, but yesterday, fools could adore
For the smoothness it held, or the tint which it wore.

Shall we build to the purple of pride,
The trappings which dizen the proud?
Alas! they are all laid aside,
And here's neither dress nor adornment allow'd,
But the long winding-sheet and the fringe of the shrou

To riches? Alas! 'tis in vain,
Who hid in their turns have been hid;
The treasures are squander'd again;
And here in the grave are all metals forbid,
But the tinsel that shone on the dark coffin-lid.

To the pleasures which mirth can afford,
The revel, the laugh, and the jeer?
Ah! here is a plentiful board,
But the guests are all mute as their pitiful cheer,
And none but the worm is a reveller here.

Shall we build to affection and love?
Ah! no; they have wither'd and died,
Or fled with the spirit above—

Friends, brothers, and sisters, are laid side by side,
Yet none have saluted, and none have replied.

Unto sorrow? The dead cannot grieve,
Not a sob, not a sigh, meets mine ear
Which compassion itself could relieve;
Ah! sweetly they slumber, nor hope, love, or fear;
Peace, peace is the watchword, the only one here.

Unto death, to whom monarchs must bow?
Ah! no; for his empire is known,
And here there are trophies enow;
Beneath the cold dead, and around the dark stone,
Are the signs of a sceptre that none may disown.

The first tabernacle to Hope we will build,
And look for the sleepers around us to rise;
The second to Faith, which ensures it fulfill'd;
And the third to the Lamb of the great sacrifice,
Who bequeath'd us them both when he rose to the skies.

HERBERT KNOWLES.

BIOGRAPHICAL NOTICES OF THE PRINCIPAL ENGLISH POETS.*

A VOLUME would be insufficient to contain an account, even the most meagre, of all the English poets. The following sketch is intended to familiarize the youthful reader with the leading incidents in the lives of Spenser, our great romantic,—Shakspeare, our great dramatic,—Milton, our great epic,—Pope, our great didactic,—Thomson, our great descriptive,—and Gray, our great lyric poet.

EDMUND SPENSER, the author of *The Fairy Queen*, was born in London about the year 1553. He was of good descent, and was educated at Pembroke-hall, Cambridge. Spenser's history has the romance which misfortune throws around life when connected with genius.

* This lesson is abridged from the Notices prefixed to an admirable little work,—"*Johnstone's Specimens of Sacred and Serious Poetry.*"

He was made Secretary for Ireland, an office afterwards held by Addison and other distinguished men, and obtained a grant of forfeited lands in the county of Cork. He went to live on his estate, but, on the breaking out of Tyrone's rebellion, was obliged to abandon his new home so abruptly, that one of his children perished in the flames to which the insurgents devoted his dwelling. Spenser died in London, early in 1599, of a broken heart, and, it is alleged, in very distressed circumstances. As a poet he was highly popular in his own lifetime, a distinction more rare in the age of Elizabeth than at present. By his own desire he was buried near the tomb of Chaucer. Ben Jonson supported the pall at his funeral; and all the contemporary poets—Shakspeare probably of the number—threw tributary verses into his grave.

WILLIAM SHAKSPEARE, "the immortal poet of nature," was born in the year 1564, at Stratford-upon-Avon,—a spot which, in consequence, will ever be hallowed as classic ground. His father was a woolstapler. His education, though by no means neglected, was confined to what the grammar-school of his native town could supply; but what progress he made there, what indications he gave of his future celebrity, are wholly unknown. He seems at first to have pursued his father's business; but whether he intended ultimately to follow it is uncertain, as, in consequence of his being involved in a depredation upon the deer-park of a neighbouring gentleman, he was forced to leave his native town, and betake himself to London. Here he hired himself to a company of players, and began that course which has immortalized his name. The pace with which he mounted to eminence was slow. In those days gentlemen commonly rode to the play; and, it is said, that he was at first glad to take care of their horses during the time of the performance. By this means he got a little money; and having gradually insinuated himself into the favour of the players, he was at last allowed to appear on the

stage. His celebrity as an actor, however, was not great; and the most considerable character he ever performed was the Ghost in his own play of Hamlet. The thirty-five plays which have been ascribed to him made their appearance between 1589 and 1614. *The Midsummer's Night's Dream* was the earliest, and *The Twelfth Night* the last. Queen Elizabeth had some of his plays acted before her, and even first suggested the idea of writing at least one of them; and, besides the royal patronage, the Earl of Southampton is known to have treated him with the most flattering distinction,—presenting him on one occasion with no less than L.1000, to enable him to complete a desirable purchase. Having by his writings at last acquired a decent competency, he relinquished public life, and retired to his native Stratford, where he remained till his death in April 1616, beloved by his friends, and respected by all. He was interred in the north side of the chancel, in the church of Stratford, where a monument, with his bust, was erected to his memory.

JOHN MILTON, who is pre-eminently the divine poet of England, was born in London on the 9th of December, 1608. His father was a scrivener, and a person of accomplishments and learning. Milton was educated with the most sedulous care; and the intensity of his boyish studies laid the seeds of his future blindness. After leaving Cambridge, he remained for some time in retirement at his father's house in Horton, Buckinghamshire; and there composed some of his exquisite minor pieces. When turned of thirty, after a youth of severe study, he went to Italy, "the most accomplished Englishman that ever visited her classic shores." He returned to England about the breaking out of the civil wars, and took an active part in public affairs. He came into office under Cromwell; and, as the literary champion of the Commonwealth, published many controversial pieces. Milton's sight, which had long been weak, failed entirely in middle life, and the Paradise Lost, and his other large

poems, were all composed during the long night of darkness which preceded his death. After the Restoration, the undaunted partizan of the Commonwealth could expect no favour from the government; but he had been merciful in his day of power, and some of the royalists whom he had befriended interfered for his protection. He fled for a time; but, when the first danger was over, returned to London, where he died on the 8th of November, 1674, after twenty-five years of total blindness. Milton was three times married, and left a widow and three daughters.

Milton was so beautiful in his youth, that he was called the Lady of Christ's Church College. His hair, which was of a bright brown, and parted at the forehead, hung down upon his shoulders in those "hyacinthine curls" which he has ascribed to the father of mankind. He was an active fencer, and delighted in the exercise, in which he was well skilled. The course of his domestic day, after he became blind, is thus described by Johnson:—"When he first rose he heard a chapter read in the Hebrew Bible, and then studied till twelve; then took exercise for an hour; then dined; then played on the organ and sung, or heard another sing; then studied till six; then entertained visiters till eight; then supped; and, after a pipe of tobacco and a glass of water, went to bed."

Alexander Pope, whose name is familiar to every reader of verses, was born in London in 1688. His father was a linen-draper, and acquired considerable wealth, with which he retired into the country. Pope, like Milton, was a poet from his boyhood; for his naturally delicate constitution rendered him unfit for the ordinary occupations and amusements of children. On this account his education was wholly private. Pope was an affectionate son, a constant friend, according to worldly notions of friendship, and in many instances he showed benevolence of disposition. But his private history is not one of the bright spots of literature. His quiet was con-

tinually imbittered by paltry squabbles with petty critics and ignoble rivals; nor does it appear that in his latter years there was one individual on whom he could rely for sympathy and affection. Pope, if he had any fixed religious creed, was a Roman Catholic, as both his parents had been; but he appears rather to have felt the poetical beauty of Christianity, than its power and importance. In addition to his Translations, his principal works are,—The Essay on Man, the Essay on Criticism, the Rape of the Lock, and the Satires and Epistles.

JAMES THOMSON was the son of the minister of Ednam, a place of great beauty on the banks of the Tweed. He was educated at the grammar-school of Jedburgh, and afterwards went to Edinburgh to study for the church. The professors of divinity taxing the boldness of some of the phrases in his exercises as indecent, if not profane, he abandoned all thoughts of the church, and went to London on the encouragement of a lady, who did nothing more to further his views. His finances were low, his friends none, his prospects the most precarious. But he published Winter, which, after a little time, attracted notice, and procured the friendless poet some really useful patrons. By one of these he was introduced to the Lord Chancellor Talbot; and, after publishing the other portions of the Seasons, Thomson became a person of celebrity in the world of letters, and was appointed to travel with Mr Talbot, the chancellor's son. This young man died abroad, and was deeply lamented by his tutor, who paid a tribute to his memory in the poem of Britannia. Thomson's services were rewarded by the place of Secretary to the Briefs; but at the death of the chancellor the place fell to his successor, and the indolence, bashfulness, or pride of the poet, prevented him from soliciting its renewal from Lord Hardwicke, who might have offered it, had his desire that Thomson should retain the office been very strong.

The Secretary of the Briefs, living in ease and plenty, did not trouble the world with his publications. But the

disposted poet found it necessary to resume his pen; and in this interval he produced some of his tragedies. By the kindness of Mr Lyttelton, who animated and directed the court of the Prince of Wales, who then lived in open hostility with the court of St James's, Thomson was allowed a pension of a hundred a year from the Prince, who affected to patronize men of letters. And when his friend Lyttelton came into power, he got the place of Surveyor-General of the Leeward Islands, which set him at ease for life. But his life was not of long duration. He died on the evening of the 27th August, 1748, of a fever caught by taking cold on the Thames. The Castle of Indolence, his last and most finished production, was published shortly before his death. Thomson is described as having been "more fat than bard beseems," of a heavy and lumpish figure and countenance, silent in mixed society, but cheerful with his friends. His indolence was extreme; and a most happy graphic account of his habits and appearance describes him standing in luxurious laziness, his hands in his pockets, eating the sunny-side of a peach as it temptingly hung on a friend's garden-wall. Thomson was buried in Richmond church-yard; and a monument is erected to his memory in Westminster Abbey. A monument as imperishable remains in the exquisite lines of Collins, who, with genius as high, met a fate so much less fortunate.

THOMAS GRAY was born in 1756 in London, where his father was a money-scrivener. He was educated at Eton and Cambridge, and afterwards travelled for a time with the celebrated Horace Walpole, Earl of Orford. The death of his father put him in possession of a small fortune; and he entered Cambridge, where he passed the remainder of his days; the composition of poetry being the principal enjoyment of his listless and secluded college-life. In 1768 he was appointed Professor of Modern History at Cambridge, an office which he did not long enjoy. His verses are esteemed among the most finished lyrical compositions in the English language;

and his Letters show as much talent, and perhaps more power of mind than his poetry. He was regarded as the most learned man of his age.

THE FIGURES OF SPEECH.*

The term *figure* signifies the shape or form of any piece of matter, and it has various secondary meanings, all reducible to this original idea. Arithmetical characters are called *figures*, as being peculiar marks appropriated to denote numbers. *Men of figure* are persons whom rank in life, or political influence, distinguishes from the bulk of mankind; and it may be said of men of eminent learning, or of the authors of useful discoveries and inventions in arts and sciences, that they will make a *figure* in the history of their country. Precisely on the same principles has this term been appropriated in its application to language. Certain forms of speech have been called figures, as distinguished from the usual way of expressing the same thought, and as eminently effective of eloquence.

Figurative language is opposed to *ordinary*, *plain*, or *literal* speech; and a figure of language may be defined to be a distinguished mode of speech which results from a peculiar state of mind suited to itself, and expresses a thought, mostly with some additional idea, and always more to the purpose of a writer or speaker, than ordinary language. Thus, when we say of vicious indulgence, "that the enjoyment of it is often short, the recollection of it bitter and long-continued," we express a common idea in common language. When we use the lines—

> "Pleasure, known but by its wings,
> And remembered by its stings,"

we convey the same idea in the language of figure. It is essential to figurative language that it results naturally

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* The substance of this lesson is taken from an ingenious Essay on the *Figures of Speech*, by the Rev. Alex. Carson of Ireland.

from a peculiar state of mind. Figures are the language of nature, not an invention of art; and however bold, or even apparently absurd, they originate in the principles of our constitution. In the use of them, the vulgar are often more correct than the learned; the former, speaking as nature prompts, the latter attempting to forge them by study, from an affectation of ornament. Some have ventured to call figurative language the language of barbarians, in opposition to that of cultivated life; but such writers have yet to study the subject. It is indeed the language of barbarians, but it is also the language of civilization. It is the language of the child, but it is also the language of the philosopher. *It is the language of human nature;* and the moment a man will make conscience of speaking the language of figure he will cease to speak the language of men.

1. The figures, which are founded on resemblance, are the metaphor, the comparison, or simile, and the allegory.

The *metaphor,* the most common of all the figures, substitutes one thing for another, and applies to the primary object, language which is, strictly speaking, descriptive only of the secondary. Thus, in Wolsey's description of the state of man, "To-day he puts forth the tender leaves of hope, to-morrow blossoms,"—a tree is put for man, and the changes, which can in strictness be predicated only of the secondary, tree, are attributed to the primary, man. Very many of the words of every language have received a metaphorical application; but when custom has assigned this as their appropriate meaning, they are not to be considered figures of speech. In explaining the word *enlighten,* for instance, the grammarian will say, that it signifies to instruct, in a metaphorical sense, from the resemblance between the effects of light and of information. But this term being now as much appropriated in the above sense as the proper term itself, the rhetorician does not consider it as belonging to his department.—*Comparison,* or *simile,* is founded on resemblance as well as metaphor, but it has nothing else in common with it; and though it has been sometimes

called a lengthened metaphor, it is altogether a distinct figure. Metaphor always asserts what is manifestly false; comparison asserts nothing but what is true. In metaphor the resembling qualities in the two objects must be distinguishing qualities of these objects. In comparison, any striking resemblance may be made the subject of the figure. The former asserts that one object has the properties of another; the latter, that one object resembles another. The two figures are indeed near akin, but they have a distinct personality; they are sisters, the daughters of likeness by different fathers. The one is the child of fancy, the other of truth. Comparison is much used by the poets; and a good comparison greatly enhances the interest of their writings. It adds to the beauty of composition, by suggesting some resemblance that is not obvious, though striking when pointed out. Such is the resemblance to death and the resurrection found in the following comparison:—

> Thus, at the shut of ev'n, the weary bird
> Leaves the wide air, and in some lonely brake
> Cow'rs down, and dozes to the dawn of day,
> Then claps its well-fledged wings, and bears away.

It serves to place the principal object in a clear and strong point of view.

> Full many a gem of purest ray serene,
> The dark unfathomed caves of ocean bear;
> Full many a flower is born to blush unseen,
> And waste its sweetness on the desert air.

What a happy illustration of the fact, that many persons of the greatest native talents waste them in obscure and uncultivated life! It is eminently calculated to give pleasure on all subjects, by introducing agreeable images from every part of nature. It is to such examples that the privilege of introducing circumstances in the resembling object, to which there is nothing corresponding in the principal, legitimately belongs, though it is unpardonable to load the figure with useless excrescences. Milton compares the shield of Satan to the moon, and, from the

mention of that object, takes occasion to introduce a beautiful allusion to the inventor of the telescope:—

The broad circumference
Hung on his shoulders like the moon, whose orb,
Through optic-glass, the Tuscan artist views
At evening from the top of Fesolè,
Or in Valdarno, to descry new lands,
Rivers, or mountains, in her spotty globe.

It serves also to degrade an object by associating it with low images. This is of peculiar service in works of a ludicrous nature:—

The sun had long since, in the lap
Of Thetis, taken out his nap;
And, like a lobster boiled, the morn
From black to red began to turn.

Allegory is generally considered, but incorrectly, as a continuation of metaphor. No continuation of metaphor ever becomes an allegory; indeed there are several essential properties that distinguish these figures. Allegory presents to immediate view the secondary object only; metaphor always presents the primary also. Metaphor always imagines one thing to be another; allegory never. Every thing asserted in the allegory is applied to the secondary object; every thing asserted in the metaphor is applied to the principal. In the metaphor there is but one meaning; in the allegory there are two, a literal and a figurative. Allegory is a veil; metaphor a perspective-glass. The following is adduced by Dr Blair as an example of allegory; but it is evidently nothing more than an extended metaphor:—

Did I but purpose to embark with thee
On the smooth surface of a summer's sea,
While gentle zephyrs play with prosperous gales,
And fortune's favour fills the swelling sails,
And would forsake the ship, and make the shore,
When the winds whistle and the tempests roar?

The following example, from the 80th Psalm, is one of the finest allegories:—

"*Thou hast* brought a vine out of Egypt; thou hast cast out the *heathen and planted it.* Thou preparedst room before it, and didst cause

it to take deep root, and it filled the land. The hills were covered with the shadow of it, and the boughs thereof were like the goodly cedars. She sent out her boughs unto the sea, and her branches into the river. Why hast thou then broken down her hedges, so that all they that do pass by the way do pluck her? The boar out of the wood doth waste it, and the wild beast of the field doth devour it. Return, we beseech thee, O God of hosts; look down from heaven, and behold and visit this vine."

Parables are generally allegorical, not always. Some of the Scripture parables are the finest examples of this figure to be found. The return of the Prodigal Son is an unrivalled example. Without any knowledge of the figurative application, the story is a piece of composition that excites all the most tender sensibilities of our nature. What a striking picture of human life! But what shall we say when it is considered as a lively representation of something infinitely more interesting? *Type* is a species of allegory that in the Scriptures has served a very important purpose. The types of the Mosaic dispensation served to discover to the Jews, through a veil, the grand truth revealed by the Gospel; and now, by the variety and exactness of the points of agreement, afford an irrefragable proof of the truth of Christianity. Allegory is a figure much seldomer employed than either metaphor or simile. The two last are frequently used by us, not only without any previous study, but even without any sensible exertion of the imagination; but, to form an allegory, the mind must look out for a likeness that will correspond in a variety of circumstances, and form an independent whole. The best occasion for the proper allegory is, when it is of importance to gain a man's own judgment against himself, without exciting his suspicions of our intention. We all know the effect of the parable spoken to David by Nathan; and we cannot fail to observe that no other form of speech could have here supplied the place of allegory. Many of the parables of Christ are of the same description; and the Scribes and Pharisees were often obliged to give judgment against themselves.

The same Subject continued.

BESIDES the figures founded on resemblance there are various other figures described by the rhetoricians, of which examples are to be found in the writings of poets and orators.

2. *Irony, hyperbole,* and *interrogation,* may be considered as belonging to one class, as in all of them there is an apparent inconsistency between the literal and the figurative meaning. *Irony* employs words in a sense contrary to their literal meaning. Contempt employs it as one of its peculiar weapons; it is used also in upbraiding when there is no design to reprove. *You are an honest man!* And there is one very biting species of this figure, by which a person confesses himself guilty of that of which another is guilty, whom he wishes to expose. Sometimes also the strongest manner of denying a thing is by confessing it with an indignant ironical air; and there is often no better way of getting rid of an unreasonable arguer than by ironically agreeing with him.—*Hyperbole* consists in describing a thing as greater or less than it is in reality; but however wild, it does not mean to deceive us. It is extravagant only in words, and it never expects to be understood to the full amount of its statement. The following lines have been quoted as an example of hyperbole; but they furnish a specimen of impious raving rather than of figurative language:—

> I found her on the floor,
> In all the storm of grief, yet beautiful;
> Pouring forth tears at such a lavish rate,
> That were the world on fire, they might have drown'd
> The wrath of Heaven, and quenched the mighty ruin!

We have a fine instance of this figure in the assertion of the Evangelist, when he tells us, that if all the works of Jesus had been recorded, the whole world would not have held the books; and also in the promise of God to Abram (Gen. xiii. 16), "I will make thy seed as the *dust of* the earth." *Interrogation* implies *literally* ignorance or doubt; *figuratively*, the strongest confidence of

conviction. In addition to the vehemence, earnestness, and fire, communicated to the style by this mode of speech, it derives a force of conviction from the real candour and intrepidity of truth which it evinces. It shows the perfect conviction of the speaker himself, and a fearlessness of examination. It is the clearest form in which an argument can be presented to the mind, and therefore the best calculated to produce conviction. It brings an audience to a point, and obliges them to decide.

3. *Antithesis* and *climax* are figures of arrangement. Antithesis arranges the members of a section, so as by contrast to make objects more striking. The famous example from Cicero shows how it is calculated to strengthen the impression which an orator intends that an object should make:—" Is it credible that, when he declined putting Clodius to death with the consent of all, he should choose to do it with the disapprobation of many? Can you believe that the person whom he scrupled to slay, when he might have done so with full justice, in a convenient place, at a proper time, with secure impunity, he made no scruple to murder against justice, in an unfavourable place, at an unseasonable time, and at the risk of capital condemnation?"—Climax arranges its matter so that every succeeding object or circumstance rises above that which preceded. It has a grand effect where it has scope, and is well managed; but it is proper only for things of importance. The noted example from Cicero against Verres is a fine one:—" It is highly criminal to bind a Roman citizen; to scourge him is enormous guilt; to kill him is almost parricide; but by what name shall I designate the crucifying of him?" A finer example never was uttered than that in the First Book of Samuel:—

" Now Eli was ninety and eight years old; and his eyes were dim, that he could not see. And the man said unto Eli, I am he that came out of the army, and I fled to-day out of the army. And he said, What is there done, my son? And the messenger answered and said, Israel is fled before the Philistines, and there hath been also a great slaughter among the people, and thy two sons, Hophni and Phinehas, are dead, and the ark of God is taken. And it *came to pass, when he made* mention of the ark of God, that he

fell from off the seat backward by the side of the gate, and his neck brake, and he died, for he was an old man and heavy; and he had judged Israel forty years."

The figure is correct, and the matter is in the highest degree affecting. *Israel is fled before the Philistines.* Heavy news to a patriot in any country, but insupportably afflicting to an Israelite. How afflicting then to him who was at the head of the government, and whose neglect of parental duty was the cause of the defeat! *And there hath been also a great slaughter among the people.* It was no trifling loss, no momentary disgrace. It was not only defeat, but ruin. *And thy two sons also, Hophni and Phinehas, are dead.* The calamity still grows. He was an affectionate but a too indulgent father: his sons were profligate in the extreme. Their death, in such a situation, was a terrible blow to this man of God. But the worst is still to come. The glory of their nation, the token of the Divine presence among them, the ark of God, was in the hands of the uncircumcised. *And the ark of God is taken.*

4. *Ellipsis* is prompted by great emotion, and expresses the thought in a hurried and incoherent manner. It passes with rapidity from one thing to another, without pointing out the connexion between them. The phraseology which it employs often appears incoherent and wild. Whatever strikes at the moment is uttered without order, and if before one thing is finished another occurs, the latter is immediately expressed. This figure is deficient in something essential to the grammatical construction. But many writers improperly ascribe to it every instance of grammatical abbreviation. Grammatical ellipsis is altogether different from the figurative. In conversation and familiar writing, the former is to be found in almost every sentence, and is no indication of emotion. Its end is mere brevity. We have a fine example of this figure in the words of Isaac, on discovering that he was deceived in conferring the blessing,—"Who; where is he *that hath taken* venison, and brought it me?" &c.

5. *Pleonasm* is the opposite of ellipsis; the latter hur-

ries over its objects, the former detains them as long as possible; and though at first sight it may appear strange that such opposite modes of speech should both be ornamental to style, they are alike founded in nature, and alike available to the purposes of the poet and the orator. They cannot indeed both be beautiful in the same situation; but each has its proper place which could not be supplied by the other. Pleonasm employs a redundancy of expression, not however without intention and effect. *I saw it with my eyes.* "Could you see it with your mouth?" replies the cynic. But nature and the most correct taste interpret such phraseology, and give important meaning to the apparent redundancy. Sometimes, after a general statement, various particulars are enumerated, to express the deep impression made on the mind of the speaker. Milton speaks thus with respect to his blindness:—

> "Nor to these idle orbs does day appear,
> Or sun, or moon, or stars, throughout the year,
> Or man, or woman."

After stating that he did not perceive the light of day, we needed not to be informed that he could not discern these other objects. But the person who should call this tautology, would be as devoid of soul as an ouran-outang. We can participate in the feelings of the poet, and brood with him over the objects of his regret. It sooths his melancholy to dwell on his bereavement, and it gives us a sad pleasure to accompany him. He cannot be dragged away from the pleasing objects which it is his misfortune for ever to be deprived of seeing. It is from a like principle that earnestness expresses its object again and again in nearly the same words. "Lord, hear my voice; let thine ears be attentive to the voice of my supplications." "Hear my prayer, O Lord, and let my cry come unto thee. Hide not thy face from me in the day of my trouble: incline thine ear unto me; in the day when I call *answer me* speedily." There is nothing more affecting in language than David's lamentation for

the death of his wicked son Absalom, which is just a combination of this figure and apostrophe. It is the very soul of sorrow:—" And the king was much moved, and went up to the chamber over the gate, and wept; and as he wept thus, he said, O my son, Absalom! my son, my son, Absalom! would God I had died for thee! O Absalom, my son, my son!"

6. *Personification* gives life and intelligence to inanimate objects; but it does not imply, as is sometimes asserted, any conviction, even the most momentary, of actual life and intelligence in the thing personified. We make the supposition, and enjoy all the advantages of the reality, though we are quite aware that we are figuring a thing to be what we know it is not. The chief intention of this figure appears to be a desire of giving vivacity to style, and, in the higher kinds of it, of giving vent to overpowering feeling. Some personifications are altogether the work of fancy, in which an attribute or quality is introduced as a person. Of this kind are those papers of Addison, Johnson, and many others, which have improperly been called allegories.

7. *Apostrophe* addresses the absent, or the dead, or, from the influence of passion, turns from the regular object of address to the person spoken of. Many fine examples of this figure are to be found in the Scriptures. David's lamentation about his son Absalom is one of the most affecting examples of an address to the dead. The Poems of Ossian are full of the most beautiful apostrophes. Cuthullin's address to his far-distant wife is the voice of Nature:—

" Strike the harp in praise of Bragela, whom I left in the isle of mist, the spouse of my love. Dost thou raise thy fair face from the rock to find the sails of Cuthullin? The sea is rolling far distant, and its white foam shall deceive thee for my sails. Retire, for it is night, my love, and the dark winds sigh in thy hair. Retire to the hall of my posts, and think of the times that are past; for I will not return till the storm of war is gone."

Personification and apostrophe are nearly related; by many they are confounded. The essential difference ap-

pears to be this:—Personification always feigns a person, and is only sometimes an address; apostrophe is always an address, the object of which is a real person, either dead or absent; or, if present, irregularly addressed from the influence of passion. Sometimes, however, they are united.

8. *Exclamation* assumes the form of an address, but it expects no reply. It asks not to be informed, but to express the strong conception which it has of its object. Interrogation and exclamation are often unskilfully confounded. The difference is this:—Interrogation, when a figure, always strongly asserts, and is used in argument; exclamation expresses agitated feeling, admiration, wonder, surprise, anger, joy, grief, &c. with respect to something that is not controverted:—"O the depth of the riches both of the wisdom and knowledge of God! How unsearchable are his judgments, and his ways past finding out!" Personification, apostrophe, exclamation, and metaphor, may all be combined:—"How art thou fallen from heaven, O Lucifer, son of the morning!"

9. *Vision* represents a past or future action or event as happening before our eyes. Instead of narrative, vision gives the very words of another. A writer, commencing the account of an action or event in his own words, abruptly begins to repeat the words of the speaker of whom he is writing:—

> "Thus, at their shady lodge arrived, both stood,
> Both turn'd, and under open sky adored
> The God that made both sky, air, earth, and heaven,
> Which they beheld, the moon's resplendent globe,
> And starry pole:—'Thou also madest the night,
> Maker Omnipotent, and thou the day.'"

Vision effects its purposes also by placing the speaker on the spot where the action or event happens, and by causing him to assume the direction of what takes place. He gives orders with uncontrolled authority, with respect to things over which he has not the smallest influence, and in which he is no more concerned than another. *He addresses the spectators on every important occasion,*

and they can see nothing but as he directs their attention. The following picture of the passage of the English through the deep vale of the Till, and of the fatal inactivity of the Scottish army, is a fine instance of this figure :—

"High sight it is, and haughty, while
They dive into the deep defile;
Beneath the caverned cliff they fall,
Beneath the castle's airy wall.
  By rock, by oak, by hawthorn tree,
Troop after troop is disappearing;
Troop after troop their banners rearing,
  Upon the eastern bank you see,
Still pouring down the rocky den,
Where flows the sullen Till;
And rising from the dim-wood glen,
Standards on standards, men on men,
  In slow succession still,
And bending o'er the Gothic arch,
And pressing on, in ceaseless march,
  To gain th' opposing hill.

And why stands Scotland idly now,
Dark Flodden, on thy airy brow,
Since England gains the pass the while,
And struggles through the deep defile?
What checks the fiery soul of James?
Why sits that champion of the dames
  Inactive on his steed,
And sees, between him and his land,
Between him and Tweed's southern strand,
  His host Lord Surrey lead?
What vails the vain knight-errant's brand?—
O, Douglas, for thy leading wand!
  Fierce Randolph, for thy speed!
O for one hour of Wallace wight,
Or well-skilled Bruce, to rule the fight,
And cry—'Saint Andrew and our right!'
Another sight had seen that morn,
From Fate's dark book a leaf been torn,
And Flodden had been Bannockburn!"

CHEMICAL ATTRACTION.

Mrs B. Emily. Caroline.

E. Is there not another attraction in bodies besides cohesion and gravity, Mrs B.?

Mrs B. There is; the various bodies in nature, you must observe, are composed of certain elementary principles.

C. Yes; I know that all bodies are composed of fire, air, earth, and water; that I learnt many years ago.

Mrs B. But you must now endeavour to forget it. It is now proved, that neither fire, air, earth, nor water, can be called elementary bodies. For an elementary body is one that has never been decomposed, that is to say, separated into other substances; and fire, air, earth, and water, are all of them susceptible of decomposition.

E. I thought that decomposing a body was dividing it into its minutest parts; and if so, I do not understand why an elementary substance is not capable of being decomposed as well as any other.

Mrs B. You have misconceived the idea of *decomposition;* it is very different from mere *division.* The latter simply reduces a body into parts, but the former separates it into the various ingredients or materials of which it is composed. If we were to take a loaf of bread, and separate the several ingredients of which it is made, the flour, the yeast, the salt, and the water, it would be very different from cutting or crumbling the loaf into pieces.

E. I understand you now very well.

C. But flour, water, and other materials of bread, according to your definition, are not elementary substances.

Mrs B. No, my dear; I mentioned bread rather as a familiar comparison, to illustrate the idea, than as an example. The elementary substances of which a body is composed are called the *constituent* parts of that body; in decomposing it, therefore, we separate its constituent parts. If, *on the contrary,* we divide a body by chopping *it to pieces, or even* by grinding or pounding it to the

finest powder, each of these small particles will still consist of a portion of the several constituent parts of the whole body: these are called the *integrant* parts: do you understand the difference?

E. Yes, I think, perfectly. We *decompose* a body into its *constituent* parts, and *divide* it into its *integrant* parts.

Mrs B. Exactly so. If, therefore, a body consists of only one kind of substance, though it may be divided into its integrant parts, it is not possible to decompose it. Such bodies are therefore called *simple* or *elementary*, as they are the elements of which all other bodies are composed. *Compound bodies* are such as consist of more than one of these elementary principles. Now, chemical attraction consists in the peculiar tendency which bodies of a different nature have to unite with each other. It is by this force that all compositions and decompositions are effected.

E. What is the difference between chemical attraction and the attraction of cohesion?

Mrs B. The attraction of cohesion exists only between particles of the *same* nature, whether simple or compound; thus it unites the particles of a piece of metal which is a simple substance, and likewise the particles of a loaf of bread which is a compound. The attraction of composition, on the contrary, unites and maintains, in a state of combination, particles of a *dissimilar* nature: it is this power that forms each of the compound particles of which bread consists; and it is by the attraction of cohesion that all these particles are connected into a single mass. And observe also, that the attraction of cohesion unites particles of a similar nature, without changing their original properties; the result of such an union, therefore, is a body of the same kind as the particles of which it is formed; whilst the attraction of composition, by combining particles of a dissimilar nature, produces compound bodies quite different from any of their constituents. If, for instance, I pour on the piece of copper contained in this glass some of this liquid

(nitric acid), for which it has a strong attraction, every particle of the copper will combine with a particle of acid, and together they will form a new body, totally different from either the copper or the acid. Do you observe the internal commotion that already begins to take place? It is produced by the combination of these two substances; and yet the acid has in this case to overcome, not only the resistance which the strong cohesion of the particles of copper opposes to their combination with it, but also to overcome the weight of the copper, which makes it sink to the bottom of the glass, and prevents the acid from having such free access to it as it would if the metal were suspended in the liquid.

E. The acid seems, however, to overcome both these obstacles without difficulty, and appears to be very rapidly dissolving the copper.

Mrs B. And you may already see how totally different this compound is from either of its ingredients. It is neither colourless, like the acid, nor hard, heavy, and yellow, like the copper. If you tasted it, you would no longer perceive the sourness of the acid. It has at present the appearance of a blue liquid; but when the union is completed, and the water with which the acid is diluted evaporated, the compound will assume the form of regular crystals of a fine blue colour, and perfectly transparent. Of these I can show you a specimen, as I have prepared some for that purpose.

C. How very beautiful they are in colour, form, and transparency! Nothing can be more striking than this example of chemical attraction.

Mrs B. The term *attraction* has been lately introduced as a substitute for the word *affinity;* but I confess that I think the word *attraction* best suited to the general law that unites the integrant particles of bodies; and *affinity* better adapted to that which combines the constituent particles, as it may convey an idea of the preference which some bodies have for others, which the term *attraction* does not so well express.

E. I do not conceive how bodies can be decomposed

by chemical attraction. That this power should be the means of composing them is very obvious; but that it should, at the same time, produce exactly the contrary effect, appears to me rather paradoxical.

Mrs B. Let us call two ingredients, of which the body is composed, A and B. If we present to it another ingredient, C, which has a greater affinity for B than that which unites A and B, it necessarily follows that B will quit A to combine with C. The new ingredient, therefore, has effected a decomposition of the original body, A B; A has been left alone, and a new compound, B C, has been formed.

E. We might, I think, use the comparison of two friends who were very happy in each other's society, till a third disunited them by the preference which one of them gave to the new-comer.

Mrs B. Very well. Let us suppose that we wish to decompose the compound we have just formed by the combination of the two ingredients, copper and nitric acid. We may do this by presenting to it a piece of iron, for which the acid has a stronger attraction than for copper; the acid will consequently quit the copper to combine with the iron, and the copper will be *precipitated,* that is to say, it will be thrown down in its separate state, and reappear in its simple form. In order to produce this effect, I shall dip the blade of this knife into the fluid; and, when I take it out, you will observe, that, instead of being wetted with a bluish liquid, like that contained in the glass, it will be covered with a thin coat of copper.

C. So it is really! But then is it not the copper, instead of the acid, that has combined with the iron blade?

Mrs B. No; you are deceived by appearances: it is the acid which combines with the iron, and, in so doing, deposits or precipitates the copper on the surface of the blade.

C. And pray, Mrs B., what is the cause of the *chemical attraction* of bodies for each other? It appears to me more extraordinary or unnatural, if I may use the expres-

sion, than the attraction of cohesion, which unites particles of a similar nature.

Mrs B. It has not yet been satisfactorily explained. Perhaps, like that of cohesion or gravitation, it may merely be one of the powers inherent in matter which, in our present state of knowledge, admits of no other explanation than an immediate reference to a Divine cause.

Conversations on Chemistry.

THE FIRST SABBATH.

Raphael to Adam.

HERE finish'd he, and all that he had made
View'd, and behold all was entirely good;
So even and morn accomplish'd the sixth day:
Yet not till the Creator, from his work
Desisting, though unwearied, up return'd,
Up to the heaven of heavens, his high abode;
Thence to behold this new-created world,
The addition of his empire, how it show'd
In prospect from his throne, how good, how fair,
Answering his great idea. Up he rode
Follow'd with acclamation, and the sound
Symphonious of ten thousand harps, that tuned
Angelic harmonies: the earth, the air
Resounded (thou remember'st, for thou heard'st),
The heavens and all the constellations rung,
The planets in their station listening stood,
While the bright pomp ascended jubilant.
"Open, ye everlasting gates!" they sung,
"Open, ye heavens! your living doors; let in
The great Creator from his work return'd
Magnificent, his six days' work, a world;
Open, and henceforth oft; for God will deign
To visit oft the dwellings of just men,
Delighted; and with frequent intercourse
Thither will send his winged messengers
On errands of supernal grace."—So sung
The glorious train ascending: he through heaven,
That *open'd wide her* blazing portals, led
To God's eternal house direct the way;

A broad and ample road, whose dust is gold,
And pavement stars, as stars to thee appear
Seen in the galaxy, that milky-way
Which nightly, as a circling zone, thou seest
Powder'd with stars. And now on earth the seventh
Evening arose in Eden, for the sun
Was set, and twilight from the east came on,
Forerunning night; when at the holy mount
Of heaven's high-seated top, the imperial throne
Of Godhead fix'd for ever firm and sure,
The Filial Power arrived, and sat him down
With his great Father there; and, from his work
Now resting, bless'd and hallow'd the seventh day,
As resting on that day from all his work.
But not in silence holy kept: the harp
Had work and rested not; the solemn pipe,
And dulcimer, all organs of sweet stop,
All sounds on fret by string or golden wire,
Temper'd soft tunings, intermix'd with voice
Choral or unison: of incense clouds,
Fuming from golden censers, hid the mount.
Creation and the six days' acts they sung:
"Great are thy works, Jehovah! infinite
Thy power! what thought can measure thee, or tongue
Relate thee? Greater now in thy return
Than from the giant angels: thee that day
Thy thunders magnified; but to create
Is greater than created to destroy.
Who can impair thee, Mighty King, or bound
Thy empire? Easily the proud attempt
Of spirits apostate, and their counsels vain,
Thou hast repell'd; while impiously they thought
Thee to diminish, and from thee withdraw
The number of thy worshippers. Who seeks
To lessen thee, against his purpose serves
To manifest the more thy might: his evil
Thou usest, and from thence createst more good.
Witness this new-made world, another heaven
From heaven-gate not far, founded in view
On the clear hyaline, the glassy sea;
Of amplitude almost immense, with stars
Numerous, and every star perhaps a world
Of destined habitation; but thou know'st

Their seasons: among these the seat of men,
Earth with her nether ocean circumfused,
Their pleasant dwelling-place. Thrice happy men,
And sons of men, whom God hath thus advanced!
Created in his image there to dwell
And worship him; and in reward to rule
Over his works, on earth, in sea, or air,
And multiply a race of worshippers
Holy and just: thrice happy, if they know
Their happiness, and persevere upright!"
So sung they, and the empyrean rung
With halleluiahs: thus was the sabbath kept.

MILTON—*Paradise Lost.*

VEGETATION.

LET us endeavour to illustrate the subject of *Vegetation*, by taking a view of what happens to a bean after it has been committed to the earth. In a few days, sooner or later, according to the temperature of the weather and disposition of the soil, the external coverings open at one end, and disclose part of the body of the grain. This substance consists of two lobes, between which the seminal plant is securely lodged. Soon after the opening of the membrane, a sharp-pointed body appears, which is the root. By a kind of instinctive principle (if the expression may be allowed) it seeks a passage downward, and fixes itself into the soil. At this period the root is a smooth and polished body, and has, perhaps, but little power to absorb any thing from the earth for the nutriment of the germ. The two lobes next begin to separate, and the germ, with its leaves, may be plainly discovered. As the germ increases in size, the lobes are farther separated, and the tender leaves, being closely joined, push themselves forward in the form of a wedge. These leaves take a contrary direction to that of the root: they seek a passage upward; which, having obtained, they lay aside their wedge-like form, and spread themselves in an horizontal direction, as being the best adapted for receiving the rains and dew. The radicle, every hour

increasing in size and vigour, pushes itself deeper into the earth, from which it now draws some nutritive particles. At the same time the leaves of the germ, being of a succulent nature, assist the plant by attracting from the atmosphere such particles as the tender vessels are fit to convey. These particles, however, are of a watery kind, and have not in their own nature a sufficiency of nutriment for the increasing plant.* Vegetables, as well as animals, during their tender state, require a large share of balmy nourishment. As soon as an animal is brought to life, the milk of its mother is supplied in a liberal stream; and the tender vegetable lives upon a similar fluid, though differently supplied. For its use the farinaceous lobes are melted down into a milky juice, which is conveyed to the plant by means of innumerable small vessels which are spread through the substance of the lobes; and which, uniting into one common trunk, enter the body of the germ, and thus supply that balmy liquor, without which the plant must inevitably have perished, its root being then too small to absorb a sufficiency of food, and its body too weak to assimilate it into nourishment. Thus admirable and well-contrived is the method of Providence, in supporting the plant in its earliest and tenderest stages! As the plant increases in size, the balmy juice diminishes, till at last it is quite exhausted. The trunk of small vessels then dries up, and the external covering of the seed appears connected with the root in the form of a shrivelled bag.—In the process of vegetation there is no mortality; from the moment that the seed is lodged in its parent earth, the vegetative soul begins its operations, and, in the whole successive gradation of them, illustrates the wisdom, power, and bounty of the Creator.

These attributes of the Almighty are also strikingly

* Botanists are of opinion, that vegetables receive their principal nourishment, not from water, but from oily particles incorporated with water. *In proof of* this it is argued, that all vegetables, whose seeds *are of an oily* nature, as hemp, flax, &c., are remarkable impoverishers *of the soil.*

manifested in the provision which he has afforded them against the winter season, to secure them from the effects of cold. Those called *herbaceous*, which die down to the root every autumn, are now safely concealed under ground, preparing their new shoots to burst forth when the earth is softened in spring. Shrubs and trees, which are exposed to the open air, have all their soft and tender parts closely wrapt up in buds, which by their firmness resist all the power of frosts; the larger kind of buds, and those which are almost ready to expand, are farther guarded by a covering of resin or gum, such as the horse-chesnut, the sycamore, and the lime.

After the frost is moderated, and the earth sufficiently thawed, the first vital function in trees is the *ascent of the sap*, which is taken up by the absorbent vessels composing the inner bark of the tree, and reaching to the extremity of the fibres of the roots. The water and oil, thus imbibed by the roots, is there mixed with a quantity of saccharine matter, and formed into sap, whence it is distributed in great abundance to every individual bud. The amazing quantity of sweet liquid sap provided for the nourishment of some trees, is evident from a prevalent custom in this country of *tapping* the birch in the early part of spring; thus obtaining from each tree more than a quart of liquor, which is fermented into a species of wine. This accession of nourishment, by means of the ascent of the sap, causes the bud to swell, to break through its covering, and to spread into blossoms, or lengthen into a shoot bearing leaves. This is the first process, and, properly speaking, is all that belongs to the *springing* or *elongation* of trees; and, in all annual or deciduous plants, there is no other process. The plant absorbs juices from the earth, and, in proportion to the quantity of these juices, increases in size; it expands its blossoms, perfects its fruit; and when the ground is incapable, by drought or frost, of yielding any more moisture, or when the vessels are not able to draw it up, the plant perishes. But in *trees*, though the beginning and end of the first process is exactly similar to

what takes place in *annuals*, yet there is a second process, which, at the same time that it adds to their bulk, enables them to go on increasing through a long series of years.

This second process begins soon after the first, in this way. At the base of the foot-stalk of each leaf a small bud is gradually formed; but the absorbent vessels of the leaf, having exhausted themselves in the formation of the bud, are unable to bring it nearer to maturity. In this state it exactly resembles a seed, containing within itself the rudiments of vegetation, but destitute of absorbent vessels to nourish and evolve the embryo. Being surrounded, however, by sap, like a seed in moist earth, it is in a proper situation for growing: the influence of the sun sets in motion the juices of the bud, and of the seed; and the first operation in both of them is to send forth the roots downwards a certain depth, for the purpose of obtaining the necessary moisture. The bud accordingly shoots down its roots upon the inner bark of the tree, till they reach the part covered by the earth. Winter now arriving, the cold and defect of moisture, owing to the clogged condition of the absorbent vessels, cause the fruit and leaves to fall; so that, except the provision of buds with roots, the remainder of the tree, like an annual plant, is entirely dead: the leaves, the flowers, and fruit are gone; and what was the inner bark is no longer organized, while the roots of the buds form a new inner bark; and thus the buds with their roots contain all that remains alive of the whole tree. It is owing to this annual renovation of the *inner bark* that the tree increases in bulk; and a new coating being added every year, we are hence furnished with an easy and exact method of ascertaining the age of a tree, by counting the number of concentric circles of which the trunk is composed. A tree, therefore, properly speaking, is rather a congeries of a multitude of annual plants than a perennial individual. The sap in trees always rises as soon as the frost is abated, that when the stimulus of the warm weather in the spring acts upon

the bud, there should be at hand a supply of food for its nourishment; and if, by any means, the sap is prevented from ascending in proper time, the tree inevitably perishes. DR O. GREGORY.

SUFFERINGS OF THE EARLY CHRISTIANS.

SEVERAL happy years had passed away, during which the mind of Harry Beaufoy continued in a course of progressive improvement. His attention having been successfully directed to the observation of those proofs of Divine power and wisdom which are manifest in the works of creation, he did not relinquish a habit which proved the source of continually-increasing pleasure to him. As the powers of Harry's mind gradually unfolded, he became more of a companion to his mother. She was in the practice of devoting an hour every morning to hearing him read, and bestowed a great deal of pains in selecting subjects likely to conduce to his improvement. In consequence of enjoying this advantage, Harry Beaufoy, at the age of thirteen, was familiar with many of the finest passages of our poets and historians. His increasing knowledge of words was also made subservient to the improvement of his taste and understanding; and, as he was encouraged to ask questions and propose difficulties, the hour of reading often gave birth to some interesting conversation, calculated to impress his mind with the superior importance of moral and religious principle.

One evening, after reading an account of the sufferings of the Waldenses for their religious opinions, Harry led to a conversation of this kind, by asking his mother, whether any other people had undergone such cruel treatment as the Waldenses?

"Yes," replied she; "I have read of a people whose simplicity of character, zeal in propagating their religion, and constancy under suffering, very much resembled what we have heard of the inhabitants of the valleys." Taking up a Testament that was lying on the sofa, she

continued,—"We shall find the best account of them *here.*"

"Surely you cannot mean that the apostles resembled the Waldenses?"

"Let St Paul speak for himself," replied Mrs Beaufoy, turning to the 11th chapter of his 2d Epistle to the Corinthians, from which she read the following passage:—"*Of the Jews five times received I forty stripes save one. Thrice was I beaten with rods, once was I stoned, thrice I suffered shipwreck," &c.* "Nor were such sufferings peculiar to St Paul; they were common to all the early Christians."

"But if the Christians did not break the laws, or give any just cause of offence, I cannot understand why they should be exposed to such general persecution."

"This was one of the wise appointments of Providence for which we have reason to be thankful."

"Oh! mamma, when innocent people were shamefully treated, surely this is a strange cause for thankfulness!"

"It does appear very strange, I confess; but are you not aware that it is of the utmost importance for us to be quite sure that our religion is *true*?"

"Certainly: I never thought of doubting the truth of it; but these shocking sufferings of good people for the sake of religion are very puzzling."

"We are apt *to doubt* of things that puzzle us," replied Mrs Beaufoy; "and therefore, in an affair so important as religion, it is necessary for us to endeavour to understand the true reason of those appointments, which at first sight do not seem agreeable to the just government of Providence."

"And that," said Harry, "is the very thing I wish you to explain to me."

"Well, then, let me first ask you, Whether it is likely that the Son of God could come down from heaven, and suffer upon earth for the salvation of men, without some *very wonderful* circumstances attending such a transaction?"

"Certainly not; because the thing itself is so very astonishing. It appears more surprising the longer I think about it."

"And are we not naturally inclined to doubt an astonishing story, unless we have very good reason for believing it to be true? We might, however, be inclined to believe it, if we heard it from persons of good character, who declared that they witnessed the transaction; but if, in order to attest the truth of the story, it was necessary for these persons to expose themselves to a great deal of mortification and ill-treatment; and if, notwithstanding this, they were all to persist in giving the same account of what had happened, it seems to me impossible not to believe them."

"I think so too," said Harry; "if we can be quite sure that they were not mistaken."

"Undoubtedly that is a point which ought to be determined, before we give credit to any event out of the common course of nature; and it is our business to examine whether it was possible for the witnesses to be deceived. The first Christians united in asserting a most astonishing fact: they were poor, illiterate men, possessing neither talents nor influence to give them credit with their countrymen; but they were quite sure of what they had seen with their own eyes; and, rather than conceal or deny the truth, they willingly submitted to the greatest dangers and sufferings, not of a transient nature, but protracted through a long course of years; many of them even laying down their lives in support of this singular assertion."

"I thought, mamma, they were persecuted for being Christians, not for asserting any particular fact."

"But what was it that made them Christians? Was it not the facts which they witnessed? was it not the resurrection of Jesus that convinced them he was the Messiah?"

"Then, it seems, that asserting that Christ was the Messiah brought persecution on his disciples?"

"*Yes; and no* wonder the Jews should be enraged

at an assertion which reproached them with the guilt of despising, and rejecting, and cruelly putting to death the Son of God. Besides, it shocked all their fondest hopes and prejudices. They had worked themselves into a persuasion, that the long-promised Deliverer would, on his arrival, effect some wonderful change in the condition of their country; they did not think of a deliverance from the power and guilt of sin—of freedom from the tyranny of evil passions—but from the dominion of the Romans. They clung to this hope under every misfortune of their country, and with greater eagerness as its calamities increased; they were buoyed up by it during the miseries of the most dreadful siege recorded in history. Josephus tells us, that, on the day when the city was taken, a false prophet persuaded these infatuated people to ascend the battlements of the temple, in expectation of there receiving miraculous signs of their deliverance."

"I see it plainly now, mamma. The apostles could have nothing but ill-treatment to expect from all their countrymen who did not believe them."

"And do you believe it possible, that people would choose to undergo such sufferings in attestation of a falsehood by which they could gain no worldly advantage, while their hypocrisy would expose them to the Divine displeasure?"

"Why—no; I should think not," said Harry, rather doubtfully.

"You surprise me, my dear child. How can you suppose the possibility of such madness?"

"I was thinking just then of the Old Man of the Mountain, and that his followers would leap from the top of a tower at the slightest sign from their chief."*

"And did they expect *to gain nothing* by such implicit devotion to his will?"

"Oh, yes; they were taught from childhood to believe that it would procure them eternal happiness."

* English Stories, vol. i. p. 344.

"Then was not leaping from the tower a proof that they were *sincere* in that belief?"

"Certainly, mamma."

"Very well, Harry; then your story, instead of weakening my argument, will confirm it. The belief of these Mahometan enthusiasts related to a matter of *opinion*, in which, from what we know of the Divine government, we conclude that they were mistaken; but the assertion of the apostles related to a matter of *fact*. We know, to a *certainty*, whether we see a person or do not see him: it is a case which admits of no mistake. When Christ appeared again, it was not once, to two or three individuals, but repeatedly, and to a great number. *He was seen*, says St Paul, *of Cephas, then of the twelve. After that he was seen of above* FIVE HUNDRED *brethren at once, of whom the greater part remain unto the present.** If the story was false, would Paul have ventured to mention this host of *living witnesses*, who might so easily have come forward and contradicted the statement?"

A pause of some minutes followed, when Harry again asked his mother,—"But how came the Romans to be angry with the Christians? *They* could have no popular expectations to be disappointed; on the contrary, they must have been glad that the Messiah was not a conquering prince."

"You had better judge of the feelings of the Romans from their own account of the circumstances. Give me the fourth volume of Murphy's Tacitus out of the bookcase, and I will find the passage for you."

Harry then read to his mother the account of that dreadful fire, by which more than three quarters of the city were destroyed. Mrs Beaufoy turned over a few pages, and said,—"Read on from that place." Harry obeyed, and read as follows:—'But neither these religious ceremonies, nor the liberal donations of the prince, could efface from the minds of men the prevailing opinion,

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* 1 Cor. xv. 5, 6.

that Rome was set on fire by his own orders. In order, if possible, to remove the imputation, he determined to transfer the guilt to others. For this purpose he punished, with exquisite tortures, a race of men detested for their evil practices, by vulgar appellation commonly called Christians. The name was derived from Christ, who, in the reign of Tiberius, suffered under Pontius Pilate, the procurator of Judæa. They were put to death with exquisite cruelty, and to their sufferings Nero added mockery and derision. Some were covered with the skins of wild beasts, and left to be devoured by dogs; others were nailed to the cross; numbers were burned alive; and many, covered over with inflammable matter, were lighted up, when the day declined, to serve as torches during the night.'

"What a horrible monster that Nero must have been!" said Harry, when he had finished reading; "but it seems as if Tacitus, though he pitied the sufferings of the Christians, thought them a wicked people."

"He certainly entertained the popular prejudice against them. The Jews had been banished from Rome by the emperor Claudius, who preceded Nero, on account of their raising seditious tumults; the Christians, being only an obscure sect among the Jews, were included in the number, and the rebellious and vindictive spirit of the latter was imputed to the former without discrimination."

"I do not like Tacitus at all!" exclaimed Harry; "it was shameful to misrepresent the conduct of a people who had already suffered so much."

"Yet the testimony of Tacitus is valuable, and not less so for coming from an enemy of the Christians. You see, it proves that our Saviour suffered under Pontius Pilate, and that there were, within thirty-one years after his crucifixion, great numbers of Christians, not only in Judæa, but at Rome; and this agrees with the account we have in the Scriptures." MARIA HACK.

FOLLY OF HUMAN PURSUITS.

Blest be that hand divine, which gently laid
My heart at rest beneath this humble shed!
The world's a stately bark, on dangerous seas,
With pleasure seen, but boarded at our peril;
Here, on a single plank, thrown safe ashore,
I hear the tumult of the distant throng,
As that of seas remote, or dying storms;
And meditate on scenes more silent still;
Pursue my theme, and fight the fear of death.
Here, like a shepherd gazing from his hut,
Touching his reed, or leaning on his staff,
Eager ambition's fiery chase I see;
I see the circling hunt of noisy men
Burst law's enclosure, leap the mounds of right,
Pursuing and pursued, each other's prey;
As wolves for rapine; as the fox for wiles;
Till death, that mighty hunter, earths them all!
Why all this toil for triumphs of an hour?
What though we wade in wealth, or soar in fame,
Earth's highest station ends in "Here he lies,"
And "dust to dust" concludes her noblest song.

YOUNG.

HOME.

There is a land, of every land the pride,
Beloved by Heaven o'er all the world beside;
Where brighter suns dispense serener light,
And milder moons emparadise the night;
A land of beauty, virtue, valour, truth,
Time-tutor'd age, and love-exalted youth;
The wandering mariner, whose eye explores
The wealthiest isles, the most enchanting shores,
Views not a realm so bountiful and fair,
Nor breathes the spirit of a purer air;
In every clime the magnet of his soul,
Touch'd by remembrance, trembles to that pole;
For in this land of Heaven's peculiar grace,
The heritage of nature's noblest race,
There is a *spot of* earth supremely blest,
A dearer, sweeter spot than all the rest,

Where man, creation's tyrant, casts aside
His sword and sceptre, pageantry and pride,
While in his soften'd looks benignly blend
The sire, the son, the husband, brother, friend;
Here woman reigns; the mother, daughter, wife,
Strew with fresh flowers the narrow way of life!
In the clear heaven of her delightful eye,
An angel-guard of loves and graces lie;
Around her knees domestic duties meet,
And fire-side pleasures gambol at her feet.
Where shall that land, that spot of earth be found?
Art thou a man?—a patriot?—look around;
O, thou shalt find, howe'er thy footsteps roam,
That land *thy* country, and that spot *thy* Home.

O'er China's garden-fields, and peopled floods,
In California's pathless world of woods;
Round Andes' heights, where Winter from his throne
Looks down in scorn upon the summer zone;
By the gay borders of Bermuda's isles,
Where Spring with everlasting verdure smiles;
On pure Madeira's vine-robed hills of health;
In Java's swamps of pestilence and wealth;
Where Babel stood, where wolves and jackalls drink,
'Midst weeping willows on Euphrates' brink;
On Carmel's crest; by Jordan's rev'rend stream,
Where Canaan's glories vanish'd like a dream;
Where Greece, a spectre, haunts her heroes' graves,
And Rome's vast ruins darken Tiber's waves;
Where broken-hearted Switzerland bewails
Her subject mountains and dishonoured vales;
Where Albion's rocks exult amidst the sea,
Around the beauteous isle of Liberty;
Man, through all ages of revolving time,
Unchanging man, in every varying clime,
Deems his own land of every land the pride,
Beloved by Heaven o'er all the world beside;
His Home the spot of earth supremely blest,
A dearer, sweeter spot than all the rest.

MONTGOMERY—*West Indies.*

SECTION IV.

MISCELLANEOUS EXTRACTS FROM TRAVELLERS IN THE SOUTH OF EUROPE.

St Peter's at Rome.—On the 23d of December I passed a long morning at St Peter's. All my expectations were answered by the first impression of this sublime temple. It may be true, that on first entering you are less struck than might be supposed with the immensity of the building. But this, I believe, is entirely the fault of our eyes, which are indeed the "fools of the senses;" and we are only taught to see, by reason and experience. In St Peter's, so much attention has been paid to preserve the relative proportions of all the parts, that for some time you do not perceive the largeness of the scale. For example, the figures of the Evangelists, which decorate the inside of the cupola, do not appear to be larger than life, and yet the pen in St Mark's hand is six feet long, from which one may calculate their real stature. Immediately under the glorious cupola is the tomb of St Peter, round which a hundred lamps are constantly burning. Underneath is the old church, upon which the present temple has been built; and it is here that the remains of the Apostle are said to have been deposited; though it may safely be made a question whether St Peter ever was at Rome at all. MATTHEWS.

Pompeii.—The remains of Pompeii afford a truly interesting spectacle. It is like a resurrection from the dead; the progress of time and decay is arrested, and you are admitted to the temples, the theatres, and the domestic privacy of a people, who have ceased to exist for seventeen centuries. Nothing is wanting but the inhabitants. Their theatres, temples, basilica, forums, are on the most splendid scale, but in their private dwellings we discover little or no attention to comfort. The houses

in general have a small court, round which the rooms are built, which are rather cells than rooms; the greater part are without windows, receiving light only from the door. There are no chimneys; the smoke of the kitchen, which is usually low and dark, must have found its way through a hole in the ceiling. The doors are so low that you are obliged to stoop to pass through them.

Pompeii, therefore, exhibits nothing but bare walls, and the walls are without roofs; for these have been broken in by the weight of the shower of ashes and pumicestones that caused the destruction of the town. The paintings on the walls of the amphitheatre represent the combats of gladiators and wild beasts, the dens of which remain just as they were seventeen hundred years ago. The streets are very narrow; the marks of wheels on the pavement show that carriages were in use; but there must have been some regulation to prevent their meeting each other; for one carriage would have occupied the whole of the street except the narrow path raised on each side for foot-passengers, for whose accommodation there are also raised stepping-stones, in order to cross from one side to the other. The distance between the wheel-tracks is about four feet three inches. A baker's shop is as plainly indicated as if the loaves were now at his window. There is a mill for grinding the corn, and the oven for baking; and the surgeon and the druggist have also been traced by the quality of the articles found in their respective dwellings. *Id.*

Spaniards.—There is in the national character of Spain one trait which equally pervades all classes of society; originating, I conceive, in the indolence which a warm climate, and the consequently luxurious habits, produce; this trait is the want of combination, the absence of arrangement. The Spaniards are brave, acute, patient, and faithful; but all their characteristics are *insulated; all their exertions are individual.* They have *no idea of* combining, either publicly or privately, in a

manner to call forth their respective talents, and render every one useful to the common cause.

The Germans may be said to combine too much, and the Spaniards not at all. In my judgment, the English have attained the proper medium; but certainly the Spaniards are deficient in this respect, and to this deficiency their reverses may all be ascribed. If a commander should embark on an expedition, like that to Algiers a few years ago, it is not improbable that the powder would be conveyed in one ship and the balls in another; so that if one were lost, or delayed, the other would prove useless; nor would it be unlikely to happen in their army, that ball-cartridges might be delivered to the soldiers for a review, and blank-cartridges for actual service; for I have seen errors committed equally egregious. JACOB.

Sparta.—The best geographical works apprise the reader that Misitra is not ancient Lacedæmon; but I had forgotten the circumstance. Judge then of my embarrassment when, from the top of the castle of Misitra, I persisted in the attempt to discover the city of Lycurgus in a town absolutely modern. "This Misitra," said I to the Cicerone, "is Lacedæmon; is it not?" "Signor; Lacedæmon? What did you say?" rejoined he.—"Is not this Lacedæmon, or Sparta?" "Sparta; what do you mean?"—"I ask you if Misitra is Sparta?" "I don't understand you."—"What, you a Greek, you a Lacedæmonian, and not know the name of Sparta?" "Sparta! Oh, yes! Great republic; celebrated Lycurgus." "Is Misitra then Lacedæmon?" The Greek nodded in affirmation. I was overjoyed. "Now," I resumed, "explain to me what I see. What part of the town is that?" I pointed at the same time to the quarter before me a little to the right. "Mesochorion," answered he. "That I know perfectly well; but what part of Lacedæmon was it?" "I don't know." I was beside myself! "At least show me the river," cried I, and repeated, "*Potamos, Potamos?*" My Greek pointed to *the stream called the* Jews' River. "What, is that the

Eurotas? Impossible! Tell me where is the Vasilipotamos?" The Cicerone, after many gestures, pointed to the right towards Amyclæ. "Where then is Sparta? Have I come so far without being able to discover it? Must I return without beholding its ruins?" I was heartily vexed. As I was going down from the castle, the Greek exclaimed, "Your Lordship, perhaps, means Palæochori?" At the mention of this name, I recollected the passage of D'Anville, and cried out in my turn, "Yes; Palæochori! The old city, Where is that?—Where is Palæochori?"—"Yonder, at Magoula," said the Cicerone, pointing to a white cottage with some trees about it, at a considerable distance in the valley. Tears came into my eyes when I fixed them on this miserable hut, erected on the forsaken site of one of the most renowned cities of the universe, now the only object that marks the spot where Sparta flourished, the solitary habitation of a goatherd, whose whole wealth consists in the grass that grows upon the graves of Agis and of Leonidas. CHATEAUBRIAND.

Athenian Buildings.—The first thing that strikes you in the edifices of Athens is the beautiful colour of those monuments. In our climate, in an atmosphere overcharged with smoke and rain, stone of the purest white soon turns black, or of a greenish hue. The serene sky and the brilliant sun of Greece merely communicate to the marble of Paros and Pentelicus, a golden tint resembling that of ripe corn or the autumnal foliage. The correctness, the simplicity, and the harmony of the proportions, next demand your admiration. You here see neither order upon order, column upon column, nor dome upon dome. The Temple of Minerva, for example, is a simple oblong parallelogram, adorned with a vestibule, a *pronaos* or portico, and raised upon three steps, which run all round. This pronaos occupied near one-third of the total length of the edifice. The lines of the capital, and the fluting of the columns of the Parthenon, are so sharp that you would be tempted to suppose that the entire column had passed through a lathe. No turner's

work in ivory can be more delicate than the Ionic ornaments of the temple of Erectheus; and the cariatides of the Pandroseum are perfect models. If, after viewing the edifices of Rome, those of France appeared coarse to me, the structures of Rome now seem barbarous in their turn, since I have seen the monuments of Greece; not even excepting the Parthenon, with its disproportionate pediment. The comparison may be easily made at Athens, where the Grecian architecture is often placed quite close to the architecture of Rome. *Id.*

POMPEII.

The shroud of years thrown back, thou dost revive,
Half-raised, half-buried, dead, yet still alive!
Gathering the world around thee, to admire
Thy disinterment, and with hearts on fire,
To catch the form and fashion of the time
When Pliny lived, and thou wert in thy prime;
So strange thy resurrection, it may seem
Less waking life than a distressful dream.

Hushed is this once gay scene, nor murmurs more
The city's din, the crowd's tumultuous roar,
The laugh convivial, and the chiming sound
Of golden goblets with Falernian crowned;
The mellow breathings of the Lydian flute,
And the sweet drip of fountains as they shoot
From marble basements,—these, all these are mute!
Closed are her springs, unnumbered fathoms deep,
Her splendid domes are one dismantled heap,
Her temples soiled, her statues in the dust,
Her tarnished medals long devoured by rust;
Its rainbow-pavements broken from the bath,
The once thronged Forum an untrodden path;
The fanes of love forgotten cells, the shrines
Of vaunted gods inurned in sulphur-mines,
The abodes of art, of luxury, and taste,
Tombs of their once-glad residents—a waste,
O'er which compassionate years have gradual thrown
The trailing vine, and bid the myrtle moan.

LYRICAL GEMS.

GREECE.

Clime of the unforgotten brave!
Whose land from plain to mountain-cave
Was Freedom's home or Glory's grave—
Shrine of the mighty! can it be,
That this is all remains of thee?
Approach, thou craven crouching slave—
Say, is not this Thermopylæ?
These waters blue that round you lave,
Oh servile offspring of the free—
Pronounce what sea, what shore is this?
The gulf, the rock of Salamis!
These scenes—their story not unknown—
Arise, and make again your own;
Snatch from the ashes of your sires
The embers of their former fires,
And he who in the strife expires
Will add to their's a name of fear,
That Tyranny shall quake to hear,
And leave his sons a hope, a fame,
They too will rather die than shame;
For Freedom's battle once begun,
Bequeathed by bleeding Sire to Son,
Though baffled oft is ever won.
Bear witness, Greece, thy living page,
Attest it many a deathless age;
While kings in dusty darkness hid,
Have left a nameless pyramid,
Thy heroes—though the general doom
Hath swept the column from the tomb,
A mightier monument command,
The mountains of their native land!
There points thy Muse to stranger's eye
The graves of those that cannot die!
'Twere long to tell, and sad to trace,
Each step from splendour to disgrace,
Enough—no foreign foe could quell
Thy soul, till from itself it fell,
Yes, Self-abasement paved the way
To villain-bonds and despot-sway.

Byro

PRESSURE OF WATERY FLUIDS.

WHEN we make the division of fluids into watery and aeriform, we arrange them more accurately than if we used the old distinction of non-elastic and elastic; for though the aeriform fluids are much more elastic than the watery, the latter are by no means without elasticity. It was at one time believed that they could not be compressed, or made to occupy a smaller space by being squeezed. A society of scientific men in Tuscany made an experiment which was for a long while supposed to prove this. They filled a hollow ball of thin beaten gold with water, and placing it in a press or vice, they applied a great force to squeeze it; instead of altering the shape of the ball, the pressure made the water ooze through the pores of the gold, and stand in drops on its surface. But although this only proved that the water was not easily compressible, it did not show that no force could change its bulk; and Mr Canton afterwards proved that liquids are in some degree compressible, and therefore elastic. His experiment was very simple, and quite decisive. He observed the height at which water, or any other liquid, stood in a glass tube in the air; and then, by means of an air-pump, he removed or sucked out the air; and found the liquid rose in the tube, so that the weight of the air must before have compressed the liquid, or made it fill a smaller space. That watery fluids have some elasticity is indeed so plainly proved by every day's experience as to occasion some wonder at the contrary ever having been asserted. The common play of making ducks and drakes, that is, throwing a flat stone in a direction nearly horizontal against a surface of water, and thus making it rebound, proves the water to be elastic; and a musket-ball when so fired flies up in like manner, after striking the water. But you have only to pour water into an empty basin to be convinced of its elasticity; the first water that falls sparks about, flying up from the basin, and then what falls on the surface of the water which has been poured in will not fly so much

up, because the water is much less elastic than the basin; and on a glass it will fly still more, glass being the most elastic body we know. But a piece of suet or putty, or any other non-elastic body, will not rebound even from glass.

All the particles of fluids are so connected together, that they press equally in every direction, and are equally pressed upon; each particle presses equally on all the particles that surround it, and is equally pressed upon by these; it equally presses upon the solid bodies which it touches, and is equally pressed upon by those bodies. From this, and from their gravity, it follows, that when a fluid is at rest, and left to itself, all its parts rise or fall, so as to settle at the same level, no part standing above or sinking below the rest. Hence if we pour water or any other liquid into a tube or pipe bent double like a U, it will stand at the very same height in both limbs. Nor does it make any difference if one limb is wider than the other. For, suppose we knock off the bottoms of a quart-bottle and of a phial, and plunge them upright in a trough of water, the water will enter both the phial and the bottle, and stand at the same level in both, being the same with the level of the water outside the glass, or of the whole water in the trough before the bottle or phial was placed in it. Suppose we join the bottoms of the two by a phial or tube passing from one to the other in the water, and enclosing so much water, this will make no difference in the level of the water either in the upright bottles or in the trough generally. So if we solder this cross phial or tube to the two upright ones, so as to make the joinings water-tight, and thus to form one vessel, this can make no difference on the level of the water; then, if we remove the vessel thus formed from the trough, the water must stand in it exactly as it did when in the trough, because it is manifestly impossible that it should make any difference to the water inside the bottle, whether there be water on the outside or *only air*; and the water will stand as high in the wide *bottle as in* the narrow phial. In like manner, if in-

stead of filling the bottles by plunging them in the full trough, we pour water into them when empty and standing in the empty trough, and at the same time we pour water into the trough, the water will stand equally high in both bottles; and so if we only pour it into the bottles, and not into the trough at all, or into the bottles without any trough; because it can make no difference to the water inside the glass, whether there be any outside or not, there being no communication whatever between the inside and outside. Generally, then, and in every case, if there be two tubes or limbs of a tube connected together, however different their width may be, a fluid poured into them will stand at the same level, and thus a portion of fluid, however small, will resist the pressure of a portion however large, and balance it.

From these considerations two most important conclusions follow; the one is, that water, by being confined in pipes or close channels of any kind, will rise to the height from which it came, that is, as high as its source; and upon this principle depend all the useful contrivances for conveying water by pipes, in a way far more easy, cheap, and effectual than those vast buildings called aqueducts, by which the ancients carried their supplies of water in artificial rivers over arches for many miles. The other is not less true, but far more extraordinary, and indeed startling to our belief, if we did not consider the reasoning upon which it is founded; it is, that the pressure of the water upon any object is not at all in proportion to the bulk of the water, but only to the size of the surface on or against which it presses, and its own height above that surface; in other words, that any quantity of water, however small, may be made to support any quantity however great. This principle is called the *Hydrostatical paradox; paradox* signifying something, which, though true, appears, when first considered, to be untrue. We are at first startled by the apparent impossibility of the statement. But when we come to examine it *more closely*, we find it to be accurately true; *for the small tube, in* the case just mentioned, may be

made ever so narrow, and to hold ever so little water, while the wide tube communicating with it may be made ever so large, and holding ever so much water; and the level at which the water stands in both tubes will be the same.

Every thing thus depending upon the height and the surface, and nothing upon the bulk of the fluid, we may easily perceive what mischief may be done by a very small quantity of water, if it happens to be applied or distributed so as to stand high, in however thin a body or column, and to spread over a wide but confined and shallow space. Suppose that, in any building, a very small quantity of water has settled, and is confined to the extent of a square yard on the ground near the foundation, and suppose it to fill up the whole vacant space or crevice of no more than half an inch deep, between the ground and some part of the masonry; if you take a tube, however slender, of twenty feet long, and thrust it down into the water, and then fill it with water from above, you apply a force or pressure equal to six tons under the space of only a yard square of the building, and destroy it as easily as if you had mined it with gunpowder. This may be easily tried with a hogshead of water, or any other liquid, by fixing a small strong pipe in the bung-hole, and pouring water through it; when the water rises in the pipe to a sufficient height (and this will be more or less according to the strength of the barrel), the barrel will burst, although but a very small quantity of water may have been poured into the pipe.

The same effect may be produced naturally, by the rain falling into and filling some long narrow chink that may have been left in the walls of a building, or may be made by its decay in the course of time; and whether the chink be equally wide throughout, or vary in its size, and whether it be straight like a pipe, or crooked, makes no difference; provided it is water-tight, so as to get full of the rain, the pressure will always be in proportion to its perpendicular height, and not to its length if it winds. The same process in nature may produce the most ex-

tensive devastation; it may cause earthquakes, and split or heave up mountains. Suppose in the bowels of some mountain there should be an empty space of ten yards square, and only an inch deep on an average, in which a thin layer of water had lodged so as to fill it entirely; and suppose that, in the course of time, a small crack of no more than an inch in diameter should be worn from above, 200 feet down to the layer of water; if the rain were to fill this crack the mountain would be shaken, perhaps rent in pieces with the greatest violence, being blown up with a force equal to the pressure of above 5022 tons of water, though not above a ton and a half altogether had been actually applied. This prodigious power, however, may be applied safely, and even beneficially. In the operations of nature it is probably an important agent; and it is capable of being applied advantageously in the operations of art. BROUGHAM.

THE HOLY LAND.

PALESTINE, the land of Israel, the kingdom of David and Solomon, the most favoured and the most guilty country under heaven,—during between two and three thousand years the only section of the earth where the worship of the true God was perpetuated,—

> "Over whose acres walked those blessed feet
> Which eighteen hundred years ago were nailed,
> For our advantage, to the bitter cross,"—

is a small canton of Syria, included within the limits of the Turkish empire, and governed by the pashas of Acre and Damascus. In the map it presents the appearance of a narrow slip of country, extending along the eastern coast of the Mediterranean; from which, to the river Jordan, the utmost width does not exceed fifty miles. This river was the eastern boundary of the land of Canaan, or Palestine, properly so called, which derived its name from the Philistines or Palestines originally inhabiting the coast. To three of the twelve tribes, however, Reuben, Gad, and Manasseh, portions of territory

were assigned on the eastern side of the river, which were afterwards extended by the subjugation of the neighbouring nations. The territory of Tyre and Sidon was its ancient border on the north-west; the range of the Libanus and Anti-Libanus forms a natural boundary on the north and north-east; while in the south it is pressed upon by the Syrian and Arabian deserts. The kingdom of David and Solomon, however, extended far beyond these narrow limits. In a north-eastern direction it was bounded only by the river Euphrates, and included a considerable part of Syria. On the east and south-east it was extended by the conquest of the country of Moab, that of the Ammonites, and Edom; and tracts which were either inhabited or pastured by the Israelites lay still further eastward. In the time of David, the people of Israel, women and children included, amounted, on the lowest computation, to five millions, besides the tributary Canaanites, and other conquered nations.

The vast resources of the country, and the power of the Jewish monarch, may be estimated, not only by the consideration in which he was held by the contemporary sovereigns of Egypt, Tyre, and Assyria, but by the strength of the several kingdoms into which the dominions of David were subsequently divided. Damascus revolted during the reign of Solomon, and shook off the Jewish yoke. At his death, ten of the tribes revolted under Jeroboam, and the country became divided into the two rival kingdoms of Judah and Israel, having for their capitals Jerusalem and Samaria. The kingdom of Israel fell before the Assyrian conqueror in the year B. C. 721, after it had subsisted about two hundred and fifty years. That of Judah survived about one hundred and thirty years, Judea being finally subdued and laid waste by Nebuchadnezzar, and the temple burnt, B. C. 588. Idumea was conquered a few years after. From this period till the era of Alexander the Great, Palestine remained subject to the Chaldean, Median, and Persian dynasties. *At his death,* Judea fell under the dominion of the kings *of Syria, and,* with some short and troubled intervals,

remained subject either to the kings of Syria or of Egypt, till John Hyrcanus shook off the Syrian yoke, and assumed the diadem, B. C. 130. The Asmonean dynasty, which united in the person of the monarch the functions of king and pontiff, though tributary to Roman conquerors, lasted one hundred and twenty-six years, till the kingdom was given by Anthony to Herod the Great, of an Idumean family, B. C. 39.*

At the time of the Christian era, Palestine was divided into five provinces; Judea, Samaria, Galilee, Perea, and Idumea. On the death of Herod, Archelaus, his eldest son, succeeded to the government of Judea, Samaria, and Idumea, with the title of tetrarch; Galilee being assigned to Herod Antipas, and Perea, or the country beyond Jordan, to the third brother, Philip. But in less than ten years, the dominions of Archelaus became annexed, on his disgrace, to the Roman province of Syria, and Judea was thenceforth governed by Roman procurators. Jerusalem, after its final destruction by Titus, A. D. 71, remained desolate and almost uninhabited, till the emperor Hadrian colonized it, and erected temples to Jupiter and Venus on its site. The empress Helena, in the fourth century, set the example of repairing in pilgrimage to the Holy Land, to visit the scenes consecrated by the Gospel narrative, and the country became enriched by the crowds of devotees who flocked there. In the beginning of the seventh century, it was overrun by the Saracens, who held it till Jerusalem was taken by the crusaders in the twelfth. The Latin kingdom of Jerusalem continued for about eighty years, during which the Holy Land streamed continually with Christian and Saracen blood. In 1187, Judea was conquered by the illustrious Saladin; on the decline of whose kingdom it passed through various revolutions, and, at length, in 1317, was finally swallowed up in the Turkish empire:

* Thirty-five years before the true date of our Lord's birth, which is computed *to have taken place* four years before the vulgar era.

"Trodden down
By all in turn, Pagan, and Frank, and Tartar,—
So runs the dread anathema,—trodden down
Beneath the oppressor; darkness shrouding thee
From every blessed influence of heaven;
Thus hast thou lain for ages, iron-bound
As with a curse. Thus art thou doomed to lie,
Yet not for ever."

Palestine is now distributed into pashalics. That Acre or Akka extends from Djebail nearly to Jaffa; t of Gaza comprehends Jaffa and the adjacent plains; these two being now united, all the coast is under jurisdiction of the pasha of Acre. Jerusalem, Hebr Nablous, Tiberias, and, in fact, the greater part of lestine, are included in the pashalic of Damascus, held in conjunction with that of Aleppo, which renc the present pasha, in effect, the viceroy of Syria. Thor both pashas continue to be dutiful subjects of the Gr Seignior in appearance, and annually transmit consic able sums to Constantinople to ensure the yearly rene of their office, they are to be considered as tributaries ther than subjects of the Porte; and it is supposed t the religious supremacy of the sultan, as caliph and v of Mahommed, more than any apprehension of his pov which prevents them from declaring themselves in pendent. The reverence shown for the firmauns of Porte throughout Syria, attests the strong hold which sultan maintains, in this character, on the Turkish po lation. The pashas of Egypt and Bagdad are attac to the Turkish sovereign by the same ecclesiastical which alone has kept the ill-compacted and feeble em from crumbling to ruin.

The general outlines of the surface of the country be thus laid down. The Jordan, or river of Dan, wl rises under the lofty peaks of the Anti-Libanus, and fl in a direction almost constantly southward, with the of Tiberias, through which it passes, and that of Aspl *tites* (*the* Dead Sea), which it forms by its discharge, *vides Palestine* completely from north to south. In *western division*, between the Mediterranean and

lake of Tiberias, lie the two Galilees. The plain of Esdraelon, which occupies the greater part of this tract, being two days' journey, or nearly fifty miles in length, and twenty in breadth, is described by Dr Clarke as one vast meadow, covered with the richest pasture. This plain is enclosed on all sides by the mountains, and not a house or a tree is to be discovered in it. It is completely commanded by Acre, so that the possessor of that port is the lord of one of the richest territories in the Holy Land. To the south of Galilee lies the district of ancient Samaria, now chiefly included in the district of Nablous; it is mountainous, but well cultivated, and forms at present the most flourishing part of the Holy Land. Judea Proper comprises the territory extending from the Dead Sea to the Mediterranean, and is composed of a range of limestone hills, rising by stages from the level of the coast, and becoming more rugged and rocky as you approach Jerusalem from Jaffa. Between Jaffa and Gaza, westward of the mountains of Judea, lies the tract distinguished as the plain of the Mediterranean Sea, the ancient territory of the Philistines, including the five cities of Gaza, Askelon, Ashdod, Gath, and Ekron. This district still bears the name of Phalastin, and forms a separate pashalic; it may be distinguished as Palestine Proper.

CONDER—*Modern Traveller.*

HYMN OF THE HEBREW MAID.

WHEN Israel, of the Lord beloved,
Out from the land of bondage came,
Her father's God before her moved,
An awful guide in smoke and flame.
By day along the astonish'd lands
The cloudy pillar glided slow;
By night, Arabia's crimson'd sands
Return'd the fiery pillar's glow.

There rose the choral hymn of praise,
And trump and timbrel answer'd keen;
And Zion's daughters pour'd their lays,
With priests' and warriors' voice between.

No portents now our foes amaze,
 Forsaken Israel wanders lone;
Our fathers would not know Thy ways,
 And Thou hast left them to their own.

But present still, though now unseen!
 When brightly shines the prosperous day,
Be thoughts of Thee a cloudy screen,
 To temper the deceitful ray.
And oh! when stoops on Judah's path
 In shade and storm the frequent night,
Be Thou, long-suffering, slow to wrath,
 A burning and a shining light!

Our harps we left by Babel's streams,
 The tyrant's jest, the Gentiles' scorn;
No censer round our altar beams,
 And mute are timbrel, trump, and horn.
But Thou hast said,—"The blood of goat,
 The flesh of rams I will not prize;
A contrite heart, a humble thought,
 Are mine accepted sacrifice."

SIR W. SCOTT—*Ivanhoe.*

CAPILLARY ATTRACTION.

It is the general rule, that no liquid can of itself rise higher in the inside of a tube than it stands on the outside; but there is an exception to this rule which requires to be explained.

If a drop of water, or any liquid of a like degree of fluidity, be pressed upon a solid surface, it will wet that surface, and stick to it, instead of keeping together, and running off when the surface is held sloping. This shows that the parts of the liquid are more attracted by the parts of the solid than by one another. In the same manner, if you observe the edge of any liquid in a vessel, as wine in a glass, and note where it touches the glass, you will see that it is not quite level close to the glass, but becomes somewhat hollow, and is raised up on it, so as to stand a little higher at the edge than in the middle and other parts of its surface. It appears, therefore,

that there is an attraction at very small distances from the edge, sufficient to suspend the part of the fluid near it, and prevent it from sinking to the level of the rest. Suppose the wine glass to be diminished, so as to leave no room for any of the wine in the middle, which lies flat and level, but only to leave room for the small rim of liquor raised up all round on the side of the glass; in other words, suppose a very small tube, placed with its lower end just so as to touch the liquor; it is evident that the liquor will stand up somewhat higher in the tube than on the outside; and if the tube be made smaller and smaller, the liquor will rise higher, there being always less weight of liquid to counterbalance the attraction of the glass.

Tubes of this very small bore are called *capillary*, from a Latin word signifying *hair*, because they are small like hairs. Generally, any tube of less than 1-20th of an inch diameter in the inside is a *capillary* tube; and if it is placed so as to touch the surface of water, the water will rise in it to a height which is greater the smaller the bore of the tube is. If the diameter of the tube is 1-50th part of an inch, the water will rise to the height of one inch; if it be 1-100th, the water will rise two inches; if 1-200th, the water will rise four inches, and so on in proportion as the bore is lessened.

The action of the tubes upon liquids depends, however, it must be recollected, upon the nature of the solid substances of which they are made. If the glass is smeared with grease so that water will not stick to it, that liquid will not rise at all; nor will it rise between two cakes of wax or of grease. So different liquids rise to different heights in the same tube, but not according to their specific gravity; for oil of turpentine, which is 1-7th lighter than water, only rises 1-4th as high. Spirit of wine, somewhat lighter than oil of turpentine, rises nearly twice as high. Mercury does not rise at all; on the contrary, it sinks considerably lower than its level outside the tube. In a tube of 1-5th inch bore, it sinks *1-5th of an inch;* and in a tube of 1-10th inch bore, it

sinks about 1-11th of an inch; so that the sinking is in the same proportion to the bore of the tubes in mercury as the rising in watery fluids, being inversely as the diameters; and melted lead is found to sink in the same manner, and according to the same rule. Again, it is observable that mercury (and probably melted lead), which sinks in this way, has always a round surface, and never stands up at the edge of the vessel containing it, unless the vessel be made of silver, or tin, or some other substance with which mercury has a strong chemical affinity. Watery fluids sink instead of rising in tubes, or between plates, which are oiled or waxed. The thickness of liquors seems to have no influence on their capillary attraction, nor has their heat; for white varnish, which is exceedingly thick and viscid, rises nearly as high as spirit of wine, and hot and cold water stand at the same height.

Capillary attraction performs many important offices in nature. Probably the distribution of moisture in the earth is regulated by it; and there is no doubt that the distribution of the juices in plants depends principally upon it. The rise of the sap and its circulation is performed in the fine capillary tubes of the wood and bark, which are the arteries and veins of vegetables. Any one may perceive how this process is performed, by twisting together several threads of cotton or worsted, and wetting them. If they are then put in a glass of any coloured fluid, as red wine or ink, and allowed to hang down to the plate on which the glass stands, the fluid will soon be perceived to creep up, and colour the whole of the threads, red or black, as the case may be; and in a short time the whole contents of the glass will come over into the plate. Capillary tubes may in this manner carry juices upwards, and distribute them through plants. The juice, it is true, cannot be so carried from a lower to a higher level in a capillary tube, and flow out from the top; but it may be carried upwards in one, and then *flow horizontally* into others; and from these it may be *carried upwards* again in a third set of tubes; or it may

be carried in any direction by capillary syphons. Spongy bodies act in all probability on liquids in the same manner, by means of a great number of extremely small capillary tubes, of which their substance is entirely composed. *Library of Useful Knowledge.*

THE TEMPLE OF FAME.

THE temple shakes, the sounding gates unfold,
Wide vaults appear, and roofs of fretted gold,
Raised on a thousand pillars wreathed around
With laurel-foliage, and with eagles crown'd:
Of bright transparent beryl were the walls,
The friezes gold, and gold the capitals:
As heaven with stars, the roof with jewels glows,
And ever-living lamps depend in rows.
Full in the passage of each spacious gate
The sage historians in white garments wait:
Graved o'er their seats, the form of Time was found,
His scythe reversed, and both his pinions bound.
Within stood heroes, who through loud alarms
In bloody fields pursued renown in arms.
High on a throne with trophies charged, I view'd
The youth that all things but himself subdued;
His feet on sceptres and tiaras trod,
And his horn'd head belied the Libyan god.
There Cæsar, graced with both Minervas, shone;
Cæsar, the world's great master, and his own;
Unmoved, superior still in every state,
And scarce detested in his country's fate.
But chief were those, who not for empire fought,
But with their toils their people's safety bought:
High o'er the rest Epaminondas stood;
Timoleon, glorious in his brother's blood:
Bold Scipio, saviour of the Roman state,
Great in his triumphs, in retirement great;
And wise Aurelius, in whose well-taught mind
With boundless power unbounded virtue join'd,
His own strict judge, and patron of mankind.
Much-suffering heroes next their honours claim,
Those of *less noisy*, and less guilty fame,

Fair virtue's silent strain: upreme of these
Here ever shines the godlike Socrates;
He whom ungrateful Athens could expel,
At all times just, but when he sign'd the shell:
Here his abode the martyr'd Phocion claims,
With Agis, not the last of Spartan names:
Unconquer'd Cato shows the wound he tore,
And Brutus his ill Genius meets no more.
But in the centre of the hallow'd choir,
Six pompous columns o'er the rest aspire;
Around the shrine itself of Fame they stand,
Hold the chief honours, and the Fane command.
High on the first the mighty Homer shone;
Eternal adamant composed his throne:
Father of verse! in holy fillets drest,
His silver beard waved gently o'er his breast:
Though blind, a boldness in his looks appears;
In years he seem'd, but not impair'd by years.
The wars of Troy were round the pillar seen:
Here fierce Tydides wounds the Cyprian Queen;
Here Hector glorious from Patroclus' fall,
Here dragg'd in triumph round the Trojan wall.
Motion and life did every part inspire,
Bold was the work, and proved the master's fire;
A strong expression most he seem'd t' affect,
And here and there disclosed a brave neglect.
A golden column next in rank appear'd,
On which a shrine of purest gold was rear'd;
Finished the whole, and labour'd every part,
With patient touches of unwearied art:
The Mantuan there in sober triumph sate,
Composed his posture, and his look sedate:
On Homer still he fix'd a reverend eye,
Great without pride, in modest majesty.
In living sculpture on the sides were spread
The Latian wars, and haughty Turnus dead;
Eliza stretch'd upon the funeral pyre,
Æneas bending with his aged sire:
Troy flamed in burning gold, and o'er the throne
Arms and the Man in golden ciphers shone.
Four swans sustain a car of silver bright,
With heads advanced, and pinions stretch'd for flight:

Here, like some furious prophet, Pindar rode,
And seem'd to labour with th' inspiring God.
Across the harp a careless hand he flings,
And boldly sinks into the sounding strings.
The figured games of Greece the column grace,
Neptune and Jove survey the rapid race.
The youths hang o'er their chariots as they run;
The fiery steeds seem starting from the stone:
The champions in distorted postures threat;
And all appear'd irregularly great.

Here happy Horace tuned the Ausonian lyre
To sweeter sounds, and temper'd Pindar's fire;
Pleased with Alcæus' manly rage t' infuse
The softer spirit of the Sapphic Muse.
The polish'd pillar diff'rent sculptures grace;
A work outlasting monumental brass.
Here smiling Loves and Bacchanals appear,
The Julian star, and great Augustus here:
The Doves, that round the infant Poet spread
Myrtles and bays, hang hov'ring o'er his head.

Here, in a shrine that cast a dazzling light,
Sate, fix'd in thought, the mighty Stagyrite:
His sacred head a radiant zodiac crown'd,
And various animals his sides surround:
His piercing eyes, erect, appear to view
Superior worlds, and look all Nature through.

With equal rays immortal Tully shone;
The Roman rostra deck'd the Consul's throne:
Gath'ring his flowing robe, he seem'd to stand
In act to speak, and graceful stretch'd his hand.
Behind, Rome's Genius waits with civic crowns,
And the great Father of his country owns.

These massy columns in a circle rise,
O'er which a pompous dome invades the skies:
Scarce to the top I stretch'd my aching sight,
So large it spread, and swell'd to such a height.
Full in the midst proud Fame's imperial seat
With jewels blazed magnificently great:
The vivid emeralds there revive the eye,
The flaming rubies show their sanguine dye,
Bright azure rays from lively sapphires stream,
And lucid amber casts a golden gleam.

With various-colour'd light the pavement shone,
And all on fire appear'd the glowing throne;
The dome's high arch reflects the mingled blaze,
And forms a rainbow of alternate rays.
When on the Goddess first I cast my sight,
Scarce seem'd her stature of a cubit's height;
But swell'd to larger size the more I gazed,
Till to the roof her towering front she raised:
With her the Temple every moment grew,
And ampler vistas open'd to my view:
Upward the columns shoot, the roofs ascend,
And arches widen, and long aisles extend.
Such was her form as ancient Bards have told,
Wings raise her arms, and wings her feet infold;
A thousand busy tongues the Goddess bears,
A thousand open eyes, a thousand list'ning ears.
Beneath, in order ranged, the tuneful Nine
(Her virgin handmaids) still attend the shrine:
With eyes on Fame for ever fix'd, they sing;
For Fame they raise their voice, and tune their string:
With Time's first birth began the heavenly lays,
And last eternal, through the length of days. POPE.

FLORAL EMBLEMS.

Frances. Emily.

F. The entomologist boasts that there is nothing analogous in the vegetable world to the metamorphosis of the butterfly; and, in poetic fervour, he resembles it to the emerging of the immortal spirit from its tabernacle of clay. But let truth and nature speak for themselves. Turn your eye, Emily, to that oriental poppy; it is just beginning to expand. The corolla is carefully folded up, and enclosed in a rough unvaried covering of green. Certainly, in this state, it is not particularly attractive; wait, however, for a moment: the sun, even at this early hour, has absorbed the dews of night, and dried and warmed the mask of rough green which envelopes the *head*; suddenly it opens, and falls off. As the butterfly *bursts from* its dull dry case in all the pride of perfection,

so does this brilliant flower instantly display its rich brown stamens, and unfold its brilliant orange wings.

E. You have pointed out an interesting phenomenon; and, whilst I have been listening to you, I have also thought how much there is in this flower corresponding with the nature of man. The root, like the infancy of the human plant, contains the whole of the future being; and the gradual unfolding of the leaves resembles the progressive stages of education.

E. Do not the varieties in the characters of our friends and acquaintance assimilate to the different productions of the flower-garden? A *rose* may be considered as the prototype of the female who lives only to diffuse happiness, to leave behind her a rich memorial of her virtues. What a striking contrast to the *Venus-catchfly*, dressed in a gay drapery, flaunting her head to the breeze, and attracting the summer-flies that skim around her! Apt emblem of those careless daughters who live at ease, "shine in the ball, and sparkle in the ring," apparently forgetful that they are reasonable beings, accountable for their conduct while in this probationary state, and formed for an endless progression in perfection and felicity! In the night-blowing *stock*, which emits its perfume only in the gloom of evening or the darkness of the night, do we not recognise that generous attachment which sheds around us the fragrance of affection, when the sun of prosperity is succeeded by the night of adversity? Look at that *gum cistus*: its blossoms are spread forth with an air of openness, and, apparently, it stands firmly and lastingly on its stem. Alas! it is the emblem of fickleness; the first cold breeze dashes it to the ground. How admirably does the *mignonette* designate a benevolent, modest, and unassuming individual, discoverable only by good works! One more simile, and I have done; it wll apply to our mother. Does she not resemble the *lavender*—beautiful in youth, fragrant in old age, sweet and delightful when early bloom has faded?

E. The simile is equally correct and pleasing, and I

shall always regard the lavender with redoubled interest. It is delightful thus to connect the characters of those we love with shrubs and flowers. I am charmed with these new ideas. They bring to mind that happy land, where the names of the great and virtuous are fabled to be engraven on the blossoms of the trees.

F. It has been customary from the earliest times to dedicate certain flowers to the honour of distinguished individuals. They are also frequently affixed as symbols to their portraits; thus, to instance a familiar example, the lily is introduced in the oldest paintings of the Madonna, and in pictures of the annunciation it is placed in the hand of the archangel, thereby denoting the advent of the Messiah. The original consecration of this flower is of high antiquity. In the Song of Solomon it is mentioned with the rose as an emblem of the church. "I am the rose of Sharon, and the lily of the valley." This alone is sufficient to explain its appearance upon religious paintings. There is, however, another circumstance which renders its connexion with pictures of a sacred nature peculiarly appropriate. The word *Nazareth*, in Hebrew, signifies a flower; and St Jerome, who mentions the circumstance, considers it to be the cause of the frequent allusion made to a rose and lily in the prophecies respecting our Lord. Hence illuminated missals are often beautifully decorated with these distinguished flowers. The scientific botanists of ancient and modern times have preserved the memory of the friends and enemies of their science, by associating them with flowers of various descriptions. Linnæus particularly delighted in drawing these fanciful analogies. This celebrated botanist, who never deigned to notice the calumnies of his enemies, thought himself sufficiently revenged by giving their names to obnoxious plants, the qualities of which appeared consonant with their characters. On the contrary, plants of opposite qualities celebrated the virtues of his friends. The *Murræa exotica* was named after one of his favourite pupils, a foreigner of distinguished

talents. *Buffonia tenuifolia* is well known to be a satire on the slender botanical pretensions of the great French zoologist.

E. It has been justly observed, that a garden is the purest of earthly pleasures; and I have spent many happy hours in the enjoyment of its innocent delights.

F. To these various sources of rational delight you may add still another. Let the various perfections of your favourite flowers continually excite you to strive after the attainment of every thing that is excellent and of good report. In the beauty of the rose you may contemplate the loveliness of virtue; and in the lily of the valley, modestly peeping forth from her green mantle, and shedding the sweetest fragrance in retirement, the endearing nature of true humility. The waiting of the sunflower for the rising of that glorious luminary to which it is apparently dedicated, will naturally remind you, that the Christian, early awake, should present to his Maker the tribute of a grateful heart, and delight to meditate on his goodness.

Wonders of the Vegetable Kingdom.

WATER, AS CONNECTED WITH GEOGRAPHY.

Water presents itself under three forms of aggregation, as a solid, when it is *ice;* as a liquid, when it is called water; and, lastly, as a vapour or atmospheric gas. Water was long regarded as an element; but modern chemistry reckons among its triumphs the discovery of the elementary substances, of which even water is composed. It is now ascertained to be a compound body formed by the union of two different kinds of air—oxygen and hydrogen. It has the property of becoming, in certain cases, much lighter than air; though, in its natural liquid state, it is 800 times heavier than that fluid; and has also the property of afterwards resuming its natural weight. Were it not for this property, evaporation could not be produced; and consequently no clouds, *rain, nor dew, could* be formed, to water and fertilize the

different regions of the earth. But, in consequence of this wonderful property, the ocean becomes an inexhaustible cistern to our world. The air and the sun constitute the mighty engine which works without intermission to raise the liquid treasures, while the clouds serve as so many aqueducts to convey them along the atmosphere, and distribute them, at seasonable periods, and in regular proportions, through all the regions of the globe.

1. *The Ocean.*—The chief properties of the ocean, which it is the business of physical geography to investigate, are its depth, the quantity of water it contains, its bottom, colour, motions, temperature, and saltness.

With respect to its *depth,* no certain conclusions have yet been formed. It has never been actually sounded to a greater depth than a mile and 66 feet. Along the coast its depth has always been found proportioned to the height of the shore; where the coast is high and mountainous, the sea that washes it is deep; but where the coast is low the water is shallow.—To calculate the *quantity of water* it contains we must therefore suppose a medium depth. If we reckon its average depth at two miles it will contain 296 millions of cubical miles of water. We shall have a more specific idea of this enormous mass of water, if we consider that it is sufficient to cover the whole globe to the height of more than 8000 feet; and if this water were reduced to one spherical mass, it would form a globe of more than 800 miles in diameter.

So far as the *bottom* of the sea has been explored, it is found to resemble the dry land. It is full of plains, caverns, rocks, and mountains, some of which are abrupt and almost perpendicular, while others rise with a gentle acclivity, and sometimes tower above the water, and form islands. The materials too which compose the bottom of the sea are the same which form the basis of the dry land. And it also resembles the land in another remarkable particular; many fresh springs, and even rivers, rise *out of it;* an instance of which occurs near Goa, on the

western coast of Hindostan, and in the Mediterranean sea, not far from Marseilles.—The sea sometimes assumes *different colours*. The materials which compose its bottom cause it to reflect different hues in different places; and its appearance is also affected by the winds and by the sun, while the clouds that pass over it communicate all their varied and fleeting colours. When the sun shines, it is green; when he gleams through a fog, it is yellow; near the poles it is black; while in the torrid zone its colour is often brown; and, on certain occasions, it assumes a luminous appearance, as if sparkling with fire.

The ocean has *three kinds of motions*. The first is that undulation which is produced by the wind, and which is entirely confined to its surface. It is now ascertained that this motion can be destroyed, and its surface rendered smooth, by throwing oil upon its waves. The second motion is that continual tendency which the whole water in the sea has towards the west, which is greater near the equator than towards the poles. It begins on the west side of America, where it is moderate; but as the waters advance westward their motion is accelerated; and, after having traversed the globe, they return, and strike with great violence on the *eastern* shore of America. Being stopped by that continent, they rush with impetuosity into the Gulf of Mexico, thence they proceed along the coast of North America, till they come to the south side of the great bank of Newfoundland, when they turn off and run down through the Western Isles. This motion is most probably owing to the diurnal revolution of the earth on its axis, which is in a direction contrary to the motion of the sea. The third motion of the sea is the *tide*, which is a regular swell of the ocean every 12½ hours. This motion is now ascertained to be owing to the attractive influence of the moon, and also partly to that of the sun. There is always a flux and reflux at the same time, in two parts of the globe, and these are *opposite to each* other, so that when our Antipodes have high water we have the same. When the

attractive powers of the sun and moon act in the same direction, which happens at the time of new and full moon, we have the highest, or *spring tides;* but when their attraction is opposed to each other, which happens at the quarters, we have the lowest, or *neap tides.*

As water is a worse conductor of heat than land, that is, absorbs and gives out heat more slowly, the *temperature* of the sea is subject to fewer and less extensive variations than the land. It is never so cold in winter, nor so hot in summer; for, when the surface of the water is cooled in winter, it becomes specifically heavier than the inferior stratum, and sinks; and when it is more heated in summer, it is carried off by evaporation, and in this way the uniformity of temperature is preserved. The *saltness* of the sea is one of its most distinctive features. It contains a great quantity of saline substances, to which it owes its peculiar taste. Besides common salt, or muriate of soda, sea-water is impregnated with muriate of magnesia, sulphate of magnesia, and sulphate of lime. And the amount of the saline ingredients varies from $\frac{1}{24}$ to $\frac{1}{28}$; the proportion being greatest at a distance from the shore, and from the vicinity of large rivers, by which the waters of the ocean are diluted. It is easier to perceive the great advantages resulting from this saltness, than to discover its origin. Without this saltness, and without the agitation in which they are continually kept, the waters of the sea would become tainted, and would be infinitely less adapted for the motion of vessels; and probably it is to this also that the inhabitants of the ocean owe their existence.

2. *Springs.*—Springs are so many little reservoirs, which receive their waters from the neighbouring ground through small lateral canals, and which discharge their excess either by overflowing or in some other manner. The origin of springs cannot be referred to one exclusive cause; Nature, simple in her general laws, avails herself of a great variety of means; thus the precipitation of atmospheric vapours, the dissolving of ice, the filtering of sea-waters, and the explosion of subterraneous vapours,

probably all concur in the formation of springs. The opinion of the ancients, which attributed the origin of springs to the filtration of the waters of the sea, is not a mere theory. It is true that all running waters have their sources far above the level of the sea. But the phenomena of capillary tubes may obtain in the interior of the earth. The sea-waters, deprived of their salt and bitter elements, may ascend through the imperceptible pores of several rocks, from which, being disengaged by the heat, they will form those subterraneous vapours to which many springs owe their origin. We may here quote the example of the Chartreux, who, seeing their springs dried up, and learning that thick vapours were observed to ascend from a neighbouring quarry newly opened, bought the quarry, closed it up, and beheld their springs reappear. To rains, dews, and other aqueous vapours, however, the principal share is assigned in producing running waters; and, in order to be convinced that this is the case, we have only to consider Apulia and other peninsulas, which are almost destitute of running water, simply because their mountains do not constitute a mass sufficient, either from its elevation or its bulk, to attract and retain the aqueous vapours of the atmosphere. On the principle, that it is from the sea the atmosphere exhales its water in the gaseous form, it is easy to explain why the interior of many great continents, such as Africa and Asia, contain such barren deserts.

3. *Rivers.*—The effusion of springs, and the flowings of melted snow form currents, more or less gentle, termed *rivulets*. The water of great rains, furrowing the sides of the mountains, forms *torrents*. The union of these currents forms *streams*, which, following the declivity of the ground, unite in a great canal, which takes the name of *river*, and conveys to the ocean the collected tribute of the earth.

The beds of rivers are the lowest parts of great chasms, formed by the same revolution which produced the mountains. The atmospheric waters may have brought down a portion of light soil which was adhering to the sides of

the mountains, and formed by their sediments horizontal plains in the bottom of certain valleys; but never could a river by its own force alone have opened for itself a passage through solid rocks, similar to those which border the upper Rhine; it must at the first have found the outline of its course deeply marked out. Running waters unceasingly wear away their beds and banks in places where the declivity is very rapid; they hollow out and deepen their channels in mountains composed of rocks of a moderate hardness—they draw along stones, and form accumulations of them in the lower part of their course—and thus their beds are often gradually elevated in the plains, while they are deepened and depressed in the mountains; but these changes, though continually going on for thousands of years, could only give form to the banks of rivers, they could in no wise create the banks themselves.

It is only the sloping of the land which can at first cause water to flow; but an impulse having been once communicated to the mass, the pressure alone of the water will keep it in motion, even if there were no declivity at all. Many great rivers, in fact, flow with an almost imperceptible declivity. The river of the Amazons has only 10½ feet of declivity upon 200 leagues of extent of water. Even the most rapid rivers have less declivity than is commonly imagined; and hence it is that one river may receive another almost as large as itself without any considerable enlargement of its bed; the augmentation of its body only accelerates its course. Sometimes one river falling into another with great rapidity, and at a very acute angle, will force the former to retrace its course, and return for a short space towards its source. This has happened more than once to the Rhone near Geneva; the impetuous Arve, which descends from the mountains of Savoy, being swollen beyond its usual size, has made the more gentle waters of the Rhone flow back into the lake of Geneva, causing the whole of the *mills to* revolve backwards.

Rivers, which descend from primitive mountains into

the secondary lands, often form *cascades* and *cataracts*. Such are the cataracts of the Nile, of the Ganges, and some other great rivers. Cataracts are also formed by lakes; of this description are the celebrated falls of the Niagara; but the most picturesque falls are those of rapid rivers, bordered by trees and precipitous rocks. Sometimes we see a body of water, before it arrives at the bottom, broken and dissipated into showers, like the Staubbach; sometimes it forms a watery arch, projected from a rampart of rock, under which the traveller may pass dry shod, as the "falling spring" of Virginia: in one place, in a granitic district, we see it, as in the Rhine not far from its source, urge on its foaming billows amongst the pointed rocks; in another, amidst lands of calcareous formation, we see it, as in the Czettina, rolling down from terrace to terrace, and presenting sometimes a sheet and sometimes a wall of water. Some magnificent cascades have been formed, at least in part, by the hands of man; as the cascade of Velino, near Terni, which has been attributed to Pope Clement VIII. The elevation of cataracts has generally been exaggerated; the highest fall known, that of Staubbach, instead of being 1100, as stated by some travellers, is only 900 according to trigonometrical measurement. When the ground does not form a steep and almost perpendicular bank, but only a very rapid declivity, and when at the same time the bed of the river is confined by rocks, the waters acquire by compression an astonishing force. Winterbotham relates, though perhaps with some exaggeration, that the river of Connecticut, in the United States, is so compressed by rocks, that it carries along on its surface pieces of lead, as if they were so many corks; and that, notwithstanding the utmost efforts, it is impossible to insert an iron point in its waters.—The periodical overflowing of rivers is a phenomenon now sufficiently well understood. That of the Nile was considered one of the greatest mysteries of nature until modern Europeans, by penetrating into the torrid zone, *discovered that this* wonderful property belonged to a

great many other rivers besides the Nile. It is now well known that in all the countries situated between the two tropics it rains incessantly during a certain season of the year, and that then all the lakes and rivers swell and overflow their banks. If a river, under the influence of these tropical rains, flows along a plain, in a direction parallel to the equator, its overflowing waters will spread with a certain degree of equality over the whole extent of its banks. Such is the case with the Oronoco, in America, the Senegal, and probably the Niger in Africa. If, on the contrary, such a river flows from a great elevation, from extensive mountains into deep plains and valleys; or, if its direction be perpendicular to the equator, that is, north and south, then the action of the tropical rains will be extremely unequal in different parts of it, and the surplus of water will be carried almost entirely towards its lower territory. This is exactly what happens in the floods of the Nile. No river beyond the torrid zone is subject to regular periodical swellings; the overflowings which occur in the temperate zones depend solely on the melting of the snow in the spring, and the quantity of rain that has fallen upon the mountains. Rivers in running into the sea present a variety of interesting phenomena; many form sand-banks, as the Senegal and the Nile; others, like the Danube, rush with such force that their waters may be distinguished from those of the sea for a considerable distance. It is only by a very large mouth, like those of the Loire or the Plata, that a river can peacefully mingle with the sea; and even rivers of this nature are sometimes repelled by the superior influence of the greater element. The most noble phenomenon of this kind is that of the giant of rivers, the Amazons. Twice a day it pours out its imprisoned waves into the bosom of the ocean. A liquid mountain is thus raised of the height of 180 feet; it frequently meets the flowing tide of the sea, and the shock of these two bodies of water is so dreadful that it makes all the neighbouring islands tremble, and forces the fishermen and navigators to fly from it in the utmost

terror. The second day after every new or full moon, the time when the tides are highest, the river also seems to redouble its power and energy; its waters and those of the ocean rush against each other like the onset of two armies. The banks are inundated with their foaming waves; the rocks, drawn along like light vessels, dash against each other almost upon the surface of the water which bears them on. Loud roarings echo from island to island. It has been said, that the Genius of the River and the God of the Ocean contend in battle for the empire of the waves.

It is reckoned, that in the old continent there are about 430 rivers which fall *directly* into the sea; while in the new continent there are at least 145 of the same description. The largest river in Europe is the Wolga, which falls into the Caspian sea, after having run a course of 1700 miles; the largest in Asia is the Hoang-ho in China, whose course is 2400 miles; the largest in Africa is the Nile, which is supposed to run 2000 miles; and the largest in America is the Amazons, which, after a course of 3000 miles, falls into the Atlantic with a body of water 150 miles in breadth. It is calculated that the rivers of the globe supply the ocean with at least 13,630 cubical miles of water in a year; and that, were the ocean completely drained of its waters, it would require *twenty thousand years* before its caverns could be again completely filled by them.

Rivers serve many important purposes in the economy of our globe. They carry off the redundant waters which fall in rains, or which ooze from the springs, which might otherwise settle into stagnant pools; they supply to the seas the loss of waters occasioned by their daily evaporation; they cool the air, and give it a gentle circulation; they fertilize the countries through which they flow; their waters afford a wholsesome drink, and the fishes they contain a delicious food for the nourishment of man; they facilitate commerce, by conveying the productions of nature and art from the inland countries to the sea; they *form mechanical* powers for driving machinery of

different kinds; they enliven and diversify the scenery of the countries through which they pass; and the cataracts which they frequently form among the mountains present us with scenes the most picturesque and sublime; so that every part of the constitution of nature is rendered subservient both to utility and to pleasure.

4. *Lakes.*—Lakes are accumulations of water surrounded on all sides by the land, and having no direct communication with the sea. They are divided into, 1. Such as neither receive nor give out rivers; 2. Such as give out rivers without receiving any; and, 3. Such as both receive and give out rivers. Of the first kind, some are temporary, and depend on the fall of rain or the melting of snow for the supply of their waters, and others are perennial, and, receiving no supply of waters from rivers, are supposed to derive it from springs at the bottom. Of the second description of lakes, the supply from springs is supposed to exceed the waste by evaporation, and the redundant quantity flows off by rivers. In the third kind of lakes, the water received by rivers must either be equal to the quantity carried off by evaporation, or the superabundant waters must have some subterraneous outlet. In such as receive and give out rivers, the quantity of water admitted, and what is carried off, are supposed nearly to balance each other. Some lakes or inland seas contain fresh water, and in others it is salt or brackish. Those which give rise to rivers, or are formed in the course of rivers, are fresh; but such as receive rivers, and have no visible outlet, contain salt water. Lake Ladoga, in Russia, one of the largest lakes in Europe, is 150 miles long, and 90 miles broad, is full of shifting quicksands, and, like many other inland seas, is much exposed to storms. Baikal, in Siberia, is the largest lake in the old world, its length being 420 miles, its breadth 80; it is remarkable for the transparency of its waters, and at certain seasons is also subject to dreadful storms. The Caspian Sea, which receives rivers, and has no visible outlet, is a collection of salt water. It is 400 miles long, and 300 miles broad; numerous gulfs

and islands are distributed along its eastern shore; in the middle it is said to be 500 fathoms deep; and being surrounded with very high land, it is also exposed to severe storms. The Caspian is 300 feet below the level of the Mediterranean. Lake Aral, to the eastward, is 150 miles long and 70 broad; is similar in its character to the Caspian; the water is salt; and extensive fisheries, particularly of the sturgeon and seal, are established on both lakes. But the lakes of the old world are far exceeded by the magnificent collections of fresh water in North America. Lake Superior, so called from being the largest on the continent, is 1500 miles in circumference, is supplied by more than 30 rivers, some of which are of considerable magnitude, and discharges its waters into Lake Huron, which is 1000 miles in circumference. Lake Huron communicates with Lake Michigan, which is also a large lake, and with Lake Erie, which is 290 miles in length, and 40 in breadth; and between Lake Erie and Lake Ontario, which latter is 600 miles in circumference, are the celebrated falls of Niagara, where a large body of water is precipitated from 140 to 160 feet of perpendicular height.

Compiled from MALTE BRUN, DICK, *and* MILLAR.

THE TREASURES OF THE DEEP.

WHAT hid'st thou in thy treasure-caves and cells,
Thou hollow-sounding and mysterious Main?
—Pale glistening pearls, and rainbow-colour'd shells,
Bright things which gleam unreck'd of, and in vain.
—Keep, keep thy riches, melancholy sea!
We ask not such from thee.

Yet more, the Depths have more!—What wealth untold
Far down, and shining through their stillness lies!
Thou hast the starry gems, the burning gold,
Won from ten thousand royal Argosies.
—Sweep o'er thy spoils, thou wild and wrathful Main;
Earth claims not these again!

Yet more, the Depths have more! Thy waves have roll'd
Above the cities *of a* world gone by!

Sand hath fill'd up the palaces of old,
Sea-weed o'ergrown the halls of revelry!
—Dash o'er them, Ocean! in thy scornful play,
Man yields them to decay!

Yet more! the Billows and the Depths have more!
High hearts and brave are gather'd to thy breast!
They hear not now the booming waters roar,
The battle-thunders will not break their rest,
—Keep thy red gold and gems, thou stormy grave—
Give back the true and brave!

Give back the lost and lovely!—those for whom
The place was kept at board and hearth so long,
The prayer went up through midnight's breathless gloom,
And the vain yearning woke 'midst festal song!
Hold fast thy buried isles, thy towers o'erthrown,
—But all is not thine own!

To thee the love of woman hath gone down,
Dark flow thy tides o'er manhood's noble head,
O'er youth's bright locks and beauty's flowery crown;
—Yet must thou hear a voice—Restore the dead!
Earth shall reclaim her precious things from thee,
—Restore the Dead, thou Sea!

MRS HEMANS.

THE CATARACT OF VELINO.

THE roar of waters!—from the headlong height
Velino cleaves the wave-worn precipice:
The fall of waters! rapid as the light
The flashing mass foams shaking the abyss;
The hell of waters! where they howl and hiss,
And boil in endless torture; while the sweat
Of their great agony, wrung out from this
Their Phlegethon, curls round the rocks of jet
That gird the gulf around, in pitiless horror set,

And mounts in spray the skies, and thence again
Returns in an unceasing shower, which round,
With its unemptied cloud of gentle rain,
Is an eternal April to the ground,
Making it all one emerald:—how profound

The gulf! and how the giant element
From rock to rock leaps with delirious bound,
Crushing the cliffs, which downward worn and rent
With his fierce footsteps, yield in chasms a fearful vent

To the broad column which rolls on, and shows
More like the fountain of an infant sea
Torn from the womb of mountains by the throes
Of a new world, than only thus to be
Parent of rivers which flow gushingly,
With many windings, through the vale:—Look back!
Lo! where it comes like an eternity,
As if to sweep down all things in its track,
Charming the eye with dread,—a matchless cataract,

Horribly beautiful! but on the verge,
From side to side beneath the glittering morn,
An Iris sits, amidst the infernal surge,
Like Hope upon a death-bed, and, unworn
Its steady dyes, while all around is torn
By the distracted waters, bears serene
Its brilliant hues with all their beams unshorn:
Resembling, 'mid the torture of the scene,
Love watching Madness with unaltered mien.

BYRON—*Childe Harold.*

SECTION V.

JERUSALEM.

The modern city of Jerusalem may be roughly stated to be about a mile in length, and half a mile in breadth. Its population is estimated at 20,000, of which 5000 are Mussulmans, 5000 Christians, and 10,000 Jews. It stands at the south end of a large plain that extends northwards towards Samaria; but it immediately occupies two small hills, having valleys or ravines on the other three sides; which, to the east and the south, are very deep. That on the east is the valley of Jehosha-

phat; that on the south is called the valley of Siloam, and (erroneously) of Gehinnon; that on the west, which is not so deep, the valley of Rephaim. On the east, Jerusalem is commanded by the Mount of Olives; on the south, by what the Christians absurdly denominate the Hill of Offence and the Hill of Evil Council; on the west, by a low rocky flat, called Mount Gihon, which rises towards the north to a commanding elevation; on the north-west, Scopo, where Titus encamped, is also higher ground than that on which Jerusalem stands: so that the Scripture representation of Jerusalem, as guarded by mountains, literally answers to its topographical situation:—"As the mountains are round about Jerusalem, so the Lord is round about his people, from henceforth, even for ever."

"When seen," says Chateaubriand, "from the Mount of Olives, Jerusalem presents an inclined plane, descending from west to east. An embattled wall, fortified with towers and a Gothic castle, encompasses the city all round; excluding, however, part of Mount Sion, which it formerly enclosed. In the western quarter, and in the centre of the city, the houses stand very close; but, in the eastern part, along the brook Kedron, you perceive vacant spaces; among the rest, that which surrounds the mosque erected on the ruins of the temple. The houses of Jerusalem are heavy square masses, very low, without chimneys or windows; they have flat terraces or domes on the top, and look like prisons or sepulchres. The whole would appear to the eye one uninterrupted level, did not the steeples of the churches, the minarets of the mosques, the summits of a few cypresses, and the clumps of nopals, break the uniformity of the plan. On beholding these stone buildings, encompassed by a stony country, you are ready to inquire if they are not the confused monuments of a cemetery in the midst of a desert.

"Enter the city, but nothing will you there find to make amends for the dulness of its exterior. You lose yourself among narrow, unpaved streets, here going up hill, there down, and you walk among clouds of dust or

loose stones. Canvass stretched from house to house increases the gloom of this labyrinth. A few paltry shops expose nothing but wretchedness to view, and even these are frequently shut, from apprehension of the passage of a cadi. Not a creature is to be seen in the streets, not a creature at the gates, except now and then a peasant gliding through the gloom, concealing under his garments the fruits of his labour, lest he should be robbed of his hard earnings by the rapacious soldier. Aside, in a corner, the Arab butcher is slaughtering some animal, suspended by the legs from a wall in ruins: from his haggard and ferocious look, and his bloody hands, you would suppose that he had been cutting the throat of a fellow-creature rather than killing a lamb. The only noise heard from time to time in the city, is the galloping of the steed of the desert: it is the janissary who brings the head of the Bedouin, or who returns from plundering the unhappy Fellah.

"Amid this extraordinary desolation, you must pause a moment to contemplate two circumstances still more extraordinary. Among the ruins of Jerusalem, two classes of independent people find in their religion sufficient fortitude to enable them to surmount such complicated horrors and wretchedness. Here reside communities of Christian monks,* whom nothing can compel to forsake the tomb of Christ; neither plunder, nor personal ill treatment, nor menaces of death itself. Cast your eyes between the temple and Mount Sion; behold another petty tribe, cut off from the rest of the inhabitants of this city. The particular objects of every species of degradation, these people bow their heads without murmuring; they endure every kind of insult without demanding justice; if their head be required, they present it to the scimitar. On the death of any member of

* Dr Clarke draws a somewhat different picture of these holy friars: he describes them as the most corpulent he had ever seen issue from the warmest cloisters of Spain or Italy. Their comfortable convent, compared *with the usual* accommodations of the Holy Land, is, he *says, like a sumptuous* and well-furnished hotel.

this proscribed community, his companion goes at night, and inters him by stealth in the valley of Jehoshaphat, in the shadow of Solomon's Temple. Enter the abodes of these people, you will find them, amid the most abject wretchedness, instructing their children to read a mysterious book, which they in their turn will teach their offspring to read. What they did five thousand years ago these people still continue to do. Seventeen times have they witnessed the destruction of Jerusalem, yet nothing can discourage them, nothing can prevent them from turning their faces towards Sion. To see the Jews scattered over the whole world, according to the word of God, must doubtless excite surprise; but, to be struck with supernatural astonishment, you must view them at Jerusalem; you must behold these rightful masters of Judea living as slaves and strangers in their own country; you must behold them expecting, under all oppressions, a king who is to deliver them."

The Jerusalem of sacred history is no more. Not a vestige remains of the capital of David and Solomon; not a monument of Jewish times is standing. The very course of the walls is changed, and the boundaries of the ancient city are become doubtful. The monks pretend to show the sites of the sacred places; but neither Calvary, nor the Holy Sepulchre, much less the Dolorous Way, the House of Caiaphas, &c., have the slightest pretensions to even a probable identity with the real places to which the tradition refers. A few gardens still remain on the sloping base of Mount Zion, watered from the pool of Siloam; the gardens of Gethsemane are still in a sort of ruined cultivation; the Mount of Olives still retains a languishing verdure, and nourishes a few of those trees from which it derives its name; but all round about Jerusalem the general aspect is blighted and barren; the grass is withered; the bare rock looks through the scanty sward; and the grain itself, like the staring progeny of famine, seems in doubt whether to come to maturity, or die in the ear. The vine that was brought from Egypt is cut off from the midst of the land; the

vineyards are wasted; the hedges are taken away; and the graves of the ancient dead are open and tenantless.

To conceive of its ancient aspect, we must endeavour to shut our eyes to the domes, and minarets, and castellated towers, which now revolt every pleasing and sacred association; we must forget the Turks, the Arabs, and the monks, and blot out from the picture the holy sepulchre, with all the horrible mummery connected with it. We must imagine ourselves looking down from Mount Olivet on a well-peopled and strongly-fortified city, occupying the oblong area of two sloping hills, about four miles in circumference, and sheltered on almost every side by more commanding elevations, cultivated in terraces, and clothed to their very summits with the olive, the fig-tree, and the palm. The city itself, if it could not boast of a Parthenon, was probably equal, in architectural decoration, to any one then standing in the world. It could not, indeed, compare with Babylon, or Nineveh, or the hundred-gated metropolis of Egypt, either in extent or magnificence; but its two temples—the one built by Solomon, and the other repaired and completed by Herod—were successively the admiration of the world. Of the latter, Josephus has left us a description, which, making every allowance for his national partiality, must be held to prove that it was every way worthy of the founder of Cesarea and Sebaste, and the other cities which attest the greatness of the Jewish monarch. The stupendous foundations on which the terrace rested, at the height of 600 perpendicular feet from the valley, which was formed to extend the area of the temple, still remain to indicate the gigantic nature of the work. From the temple the city had the appearance of an amphitheatre, the slope of the hill being just sufficient to present it to the greatest advantage. At certain distances, towers of not less strength than architectural beauty, broke the line of the walls; while, on the left, the acropolis of Zion overlooked the whole city. Modern Jerusalem, though now disfigured by intervals of waste ground and ruined heaps, still suggests the idea of "a

compact city;" but when every part was built upon, it must have peculiarly deserved this appellation. Its ancient populousness we read of with surprise; its gates received an influx of strangers from all parts; and the wealth thus poured into it rendered it probably one of the richest cities in the world. If to these topographical and political advantages we add the local sanctity which dignified the scene of so many proud historical recollections, and connect with the bulwarks, and palaces, and gardens of the metropolis of Judea, its consecrated character as the peculiar abode of Deity—the chosen mountain of Jehovah—the "city of God," we shall obtain some idea of the aspect which it once presented, when the light of heaven, which nowhere comes with a purer ray, shone on a free and favoured people, and the voice of joy and thanksgiving was heard ascending from the dwellings of her citizens.

CONDER—*Modern Traveller.*

JERUSALEM.

FALLEN is thy throne, O Israel!
  Silence is o'er thy plains;
Thy dwellings all lie desolate,
  Thy children weep in chains.
Where are the dews that fed thee
  On Etham's barren shore?
That fire from heaven that led thee
  Now lights thy path no more!

Lord, thou didst love Jerusalem;
  Once she was all thine own:
Her love thy fairest heritage,
  Her power thy glory's throne,
Till evil came and blighted
  Thy long-loved olive tree,
And Salem's shrines were lighted
  For other gods than thee.

Then sunk the star of Solyma,
  Then pass'd her glory's day,
Like heath that in the wilderness
  The light wind whirls away.

Silent and waste her bowers,
  Where once the mighty trod;
And sunk those guilty towers
  Where Baal reign'd as God.

"Go," said the Lord, "ye conquerors,
  Steep in her blood your swords,
And raze to earth her battlements,
  For they are not the Lord's.
Tell Zion's mournful daughter,
  O'er kindred bones she'll tread,
And Hinnom's vale of slaughter
  Shall hide but half her dead."

But soon shall other pictured scenes
  In brighter vision rise,
When Zion's sun shall sevenfold shine
  On all her mourners' eyes;
And on her mountains beauteous stand
  The messengers of peace;
"Salvation by the Lord's right hand!"
  They shout, and never cease. MOORE.

ATMOSPHERIC AIR.

The principal of the aeriform fluids is the air we breathe, which surrounds the earth, and forms the atmosphere. The most essential and important of its mechanical properties, is its *spring* or *elasticity*; that is to say, its power of increasing or diminishing in bulk, according as it is more or less compressed. As there is no attraction of cohesion between its particles, the expansive power of heat has no adversary to contend with but gravity; any increase of temperature, therefore, expands it prodigiously, and a diminution proportionally condenses it.

Gravity or *weight* is the other remarkable mechanical property of air; and its gravity is much greater than you may at first imagine. It is true that the particles of which it is composed are infinitely small, and particles infinitely small must be separately very light; but, then, reflect on the quantity of particles in the atmosphere. The *atmosphere* is thought to extend to about forty-five

miles from the earth, and its gravity is such, that a man of middling stature is computed to sustain, when the air is heaviest, the weight of about fourteen tons. This weight would be insupportable, were it not for the equality of the pressure on every part of the body; but, when thus diffused, we can bear even a much greater weight, without any considerable inconvenience. In bathing, we support the pressure of the water in addition to that of the atmosphere; but, because this pressure is equally distributed over the body, we are scarcely sensible of it; whilst, if your shoulders, your head, or any particular part of your frame, were loaded with the additional weight of a hundred pounds, you would sink under the fatigue. Besides this, our bodies contain air, the spring of which counterbalances the weight of the external air, and renders us less sensible of its pressure. The weight of the atmosphere, so far from being calculated to injure or incommode us, is, in reality, essential to our preservation; and if it were removed, the air within us, meeting with no external pressure to restrain its elasticity, would distend our bodies, burst the vessels that confine it, and put a period to our existence.

The air-pump affords the means of making experiments which satisfactorily evince the pressure and elasticity of the air. If I tie a piece of soft bladder over the top of an open glass-receiver, and exhaust the air from underneath it, it will burst with a loud noise. The air being taken away from the under surface, there is no longer any reaction to counterbalance the weight of the atmosphere above, and consequently the bladder is pressed inwards, until, unable to sustain the superincumbent weight, it bursts. The expansion of the air contained within a body, when it is relieved from the pressure of the external air, may be proved by placing a shrivelled apple within a close receiver, and exhausting the air. Although so shrivelled that you would not suppose there was any air within it, it will, after a few strokes of the pump, grow quite plump, and look like a fresh-gathered apple. Readmit the air, and it will instantly return to its former state.

When the pressure of the atmosphere is removed, the air within the apple expands and swells it out; but the instant the air is restored, the expansion of the internal air is checked and repressed, and the apple shrinks to its former dimensions.

The actual weight of air has been determined by experiment. A column of air reaching to the top of the atmosphere, whose base is a square inch, weighs 15 lbs. when the air is heaviest; every square inch of our bodies, therefore, sustains a weight of 15 lbs., and the total weight of the atmosphere may be known by multiplying the number of square inches that there are on the surface of the globe by 15. It amounts to about 5,000,000,000,000,000 tons. The instrument called a *barometer*, which is used to indicate the state of the weather, shows the weight of the atmosphere: its construction is extremely simple. You first fill a glass tube, about three feet in length and open only at one end, with mercury; then, stopping the open end with your finger, you immerse it in a cup containing a little of the same fluid. Instead of all the mercury which is in the tube running down into the cup, as the law of the equilibrium of fluids would lead you to expect, you will find that only part of it does so, while the remainder remains in the tube, leaving a vacant space in the upper part of the tube. The explanation of this phenomenon is this:—The space in the upper part of the tube, which the mercury has left, is necessarily a perfect vacuum; and therefore the mercury in the tube is relieved from the pressure of the atmosphere, whilst that in the cup remains exposed to it. The pressure of the air on the mercury in the cup supports the mercury in the tube, and prevents it from falling. In other words, the column of mercury balances the column of atmospheric air, and the equilibrium of the mercury is destroyed only to preserve the general equilibrium of fluids. This simple apparatus is all that is essential to a barometer. The tube, and the cup or vase, are fixed on a board for the convenience of *suspending it*; the board is graduated for the pur-

pose of ascertaining the height at which the mercury stands in the tube; and a small moveable metal plate is attached to show that height with greater accuracy. The mercury is in general sustained at the height of about 28 inches; but this weight varies according to the weight of the atmosphere, which varies according to the state of the weather. The height is greatest in dry weather, when the pressure of the atmosphere is the greatest; and least in wet weather, when the pressure is the least.

The pressure of the atmosphere explains a variety of common phenomena. When we take a draught of water out of a basin, or a running stream, we immerse our mouths in the water, and make a vacuum by drawing in the air; the pressure of the atmosphere upon the external surface of the water then forces it into the mouth. The same cause explains the process of a child sucking its mother's breasts—the action of a boy's sucker in lifting large stones—the rise of water in pumps—the effects produced by *cements*—the firm adhesion of snails and periwinkles to rocks and stones—the scarcity of water in the time of hard frosts—and the fact, that a cask will not run by the cock, unless a hole be opened in some other part of the cask.

Air, as well as water, has been found, by modern chemical analysis, to be a compound substance. Of 100 measures of atmospheric air, 21 are *oxygen*, and 79 *nitrogen* or *azotic gas;* and this proportion appears to be nearly the same both in hot and cold countries, on low plains, and on lofty mountains.* Of these constituents of the atmosphere, oxygen is that which supports combustion and animal life; nitrogen is altogether incapable of supporting either the one or the other. These component parts are rendered evident by the following experiment:—Quicksilver being enclosed in a proper vessel of atmospheric air, on heat being applied, the air will

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* The term *gas* is given to all permanently elastic fluids (that is, those that are incapable, by any known means, of being converted into a liquid), whether simple or compound, except the common air of the atmosphere.

be diminished, and the quicksilver will lose its splendour, and gradually change to a reddish powder, acquiring, at the same time, an augmentation of weight. When neither the air nor the quicksilver suffers any farther change, the separation of the principles has taken place: the one, the gas remaining in the receiver, is now unfit for supporting flame, or maintaining respiration, and is nitrogen gas: the other is absorbed by the quicksilver, while reducing to the state of an oxide, and may be extricated from it on the application of heat; when the powder, to which the quicksilver is reduced, will be restored to its metallic state, but will have lost the weight it had gained during its oxidation; this deficiency being exactly equal to the weight of the evolved gas, which is oxygen gas. These separated gases, thus differing in their properties from each other, and, from atmospheric air being again mixed, form atmospheric air of the ordinary degree of purity.

The necessity of atmospheric air to the support of life is proved by the familiar fact, that animals put under the receiver of an air-pump expire immediately when the air is extracted. It was also strikingly exemplified in the fate of the unhappy men who died in the *black-hole* of Calcutta. On the 20th of June, 1756, about eight o'clock in the evening, 146 men were forced, at the point of the bayonet, into a dungeon only 18 feet square. They had been but a few minutes confined in this infernal prison, before every one fell into a perspiration so profuse, that no idea can be formed of it. This brought on a raging thirst, the most difficult respiration, and an outrageous delirium. Such was the horror of their situation, that every insult that could be devised against the guard without, and all the opprobrious names that the viceroy and his officers could be loaded with, were repeated, to provoke the guard to fire upon them, and terminate their sufferings. Before 11 o'clock the same evening, one-third of the men were dead; and before 6 next morning, only 23 came out alive, but most of them in a *high putrid fever*. All these dreadful effects were

occasioned by the want of atmospheric air, and by their breathing a superabundant quantity of the nitrogen emitted from their lungs.

The uses of the atmosphere are so many and great, that it is almost impossible to enumerate them. It is the vehicle of *smells* by which we become acquainted with the qualities of many objects around us; it is the medium of *sound* by means of which knowledge is conveyed to our minds; it produces the blue colour of the sky; and it is the cause of the morning and evening twilight: it forms an essential requisite for carrying on all the processes of the vegetable kingdom; and it serves for the production of all those clouds, rains, and dews, which fertilize the earth. Without it the ear would never have been delighted with the "sweet music of speech," nor the eye with the view of the "fair face of nature." Above all, we are indebted to it for respiration and life:

> "The air inhaled is not the gas
> That from a thousand's lungs reek back to thine,
> Sated with exhalations rank and fell,
> Which drunk would poison the balsamic blood,
> And rouse the heart to ev'ry fever's rage,—
> But air that trembling floats from hill to hill,
> From vale to mountain, with incessant change
> Of purest element."

THE KNIGHT OF ARTS AND INDUSTRY.

Amid the greenwood shade this boy was bred,
And grew at last a knight of muchel fame,
Of active mind and vigorous lustyhed,
The Knight of Arts and Industry by name.
Earth was his bed, and boughs his roof did frame;
He knew no beverage but the flowing stream;
His tasteful well-earn'd food the sylvan game,
Or the brown fruit with which the woodlands teem:
The same to him glad summer, or the winter breme.

Him did Minerva rear and nurture well,
In every science, and in every art,
By which mankind the thoughtless brutes excel,
That can, or use, or joy, or grace impart,

Disclosing all the powers of head and heart:
Ne were the goodly exercises spared,
That brace the nerves, or make the limbs alert,
And mix elastic force with firmness hard:
Was never knight on ground mote be with him compared.

Sometimes, with early morn, he mounted gay
The hunter-steed, exulting o'er the dale,
And drew the roseat breath of orient day;
Sometimes, retiring to the secret vale,
Yclad in steel, and bright with burnish'd mail,
He strain'd the bow, or toss'd the sounding spear,
Or darting on the goal, outstripped the gale,
Or wheel'd the chariot in its mid-career,
Or strenuous wrestled hard with many a tough compeer.

At other times he pried through Nature's store,
Whate'er she in the ethereal round contains,
Whate'er she hides beneath her verdant floor,
The vegetable and the mineral reigns;
Or else he scanned the globe, those small domains,
Where restless mortals such a turmoil keep,
Its seas, its floods, its mountains, and its plains;
But more, he search'd the mind, and roused from sleep
Those moral seeds whence we heroic actions reap.

Nor would he scorn to stoop from high pursuits
Of heavenly truth, and practise what she taught.
Vain is the tree of knowledge without fruits.
Sometimes in hand the spade or plough he caught,
Forthcalling all with which boon earth is fraught;
Sometimes he plied the strong mechanic tool,
Or rear'd the fabric from the finest draught;
And oft he put himself to Neptune's school,
Fighting with winds and waves on the vext ocean pool.

To solace then these rougher toils, he tried
To touch the kindling canvass into life;
With nature his creating pencil vied,
With nature joyous at the mimic strife;
Or, to such shapes as graced Pygmalion's wife,
He hew'd the marble; or, with varied fire,
He roused the trumpet and the martial fife,
Or bade the lute sweet tenderness inspire,
Or verses framed that well might wake Apollo's lyre.

Accomplished thus he from the woods issued,
Full of great aims, and bent on bold emprize;
The work which long he in his breast had brew'd,
Now to perform he ardent did devise;
To-wit, a barbarous world to civilize.
Earth was till then a boundless forest wild:
Nought to be seen but savage woods and skies;
No cities nourish'd arts, no culture smiled,
No government, no laws, no gentle manners mild.

A rugged wight, the worst of brutes, was man:
On his own wretched kind he ruthless prey'd;
The strongest still the weakest overran;
In every country mighty robbers sway'd,
And guile and ruffian-force were all their trade.
Life was a scene of rapine, want, and wo;
Which this brave knight, in noble anger, made
To swear, he would the rascal rout o'erthrow,
For, by the powers divine, it should no more be so!

THOMSON.

MOUNTAINS.

IN taking a survey of the external features of the earth, the most prominent objects that strike the eye are those huge elevations which rise above the level of its general surface, termed *mountains*. These are distributed in various forms and sizes through every portion of the continents and islands, and, running into immense chains, form a sort of connecting band to the other portions of the earth's surface. It has been observed by some philosophers, that the most lofty mountains form two immense ridges, or belts, which, with some interruptions, extend around the whole globe in nearly the same direction. One of these ridges lies between the 45th and 55th degrees of north latitude. Beginning on the western shores of France and Spain, it extends eastward, including the Alps and the Pyrenees in Europe, the Uralian and Altaic mountains in Asia; it extends from thence to the shores of Kamtschatka, and, after a short interruption from the sea, it rises again on the western coast of

America, and terminates at Canada, near the eastern shore. It is supposed that the chain is continued completely round the globe, through the space that is covered by the Atlantic ocean, and that the Azores, and other islands in that direction, are the only summits that are visible, till we come to the British isles. The other ridge runs along the southern hemisphere, between the 20th and 30th degrees of south latitude, of which detached portions are found in the mountains of Tucuman and of Paraguay, in South America; of Monomotapa and Caffraria, in Africa; in New Holland, New Caledonia, the New Hebrides, the Friendly, the Society, and other islands in the Pacific ocean. From these ridges flows a variety of ramifications, in both hemispheres, towards the equator.

The highest mountains in the world, according to the latest accounts, are the *Himalaya* chain, north of Bengal, on the borders of Tibet. The highest mountain in this range is stated to be about 27,000 feet, or a little more than five miles in perpendicular height, and is visible at the distance of 230 miles. Next to the Himalayas are the Andes, in South America, which extend more than 4000 miles in length, from the province of Quito to the straits of Magellan. The highest summit of the Andes is Chimboracco, which is said to be 20,600 feet, or nearly four miles, above the level of the sea. The highest mountains in Europe are the Alps, which run through Switzerland and the north of Italy; the Pyrenees, which separate France from Spain; and the Dofrafeld, which divide Norway from Sweden. The most elevated ridges in Asia are Mount Taurus, Imaus, Caucasus, Ararat, the Uralian, the Altaian, and the Japanese mountains; in Africa, Mount Atlas, and the Mountains of the Moon. Some of the mountains in these ranges are found to contain immense caverns, or perforations, of more than two miles in circumference, reaching from their summits to an immeasurable depth into the bowels of the earth. From these dreadful openings are frequently thrown up, to an immense height, torrents of fire and smoke, rivers

of melted metals, clouds of ashes and cinders, and sometimes red-hot stones and enormous rocks, to the distance of several miles, accompanied with thunders, lightnings, darkness, and horrid subterraneous sounds, producing the most terrible devastations through all the surrounding districts. The most noted mountains of this kind in Europe are Mount Hecla, in Iceland; Etna, in Sicily; and Vesuvius, near the city of Naples, in Italy. Numbers of volcanoes are also to be found in South America, in Africa, in the islands of the Indian ocean, and in the empire of Japan; there being, it is said, throughout the globe, not less than 205, which have been active within a period to which history or tradition refers.

We, who live in Great Britain, where the highest mountain is little more than three quarters of a mile in perpendicular elevation, can form no adequate idea of the magnificence and awful sublimity of the mountain-scenery in some of the countries now mentioned. From the tops of the lofty ridges of the Andes, the most grand and novel scenes sometimes burst upon the eye of the astonished traveller. He beholds the upper surface of the clouds far below him, covering the subjacent plain, and surrounding, like a vast sea, the foot of the mountain; while the place on which he stands appears like an island in the midst of the ocean. He sees the lightnings issuing from the clouds, and hears the noise of the tempest, and the thunders rolling far beneath his feet, while all is serene around him, and the blue vault of heaven appears without a cloud. At other times, he contemplates the most sublime and extensive prospects—mountains ranged around him, covered with eternal snows, and surrounding, like a vast amphitheatre, the plains below—rivers winding from their sources towards the ocean—cataracts dashing headlong over tremendous cliffs—enormous rocks detached from their bases, and rolling down the declivity of the mountains with a noise louder than thunder—frightful precipices impending over his head—unfathomable caverns yawning from below—and the distant volcano sending forth its bellowings, with its

top enveloped in fire and smoke. Those who have studied nature on a grand scale, have always been struck with admiration and astonishment at the sublime and awful exhibition of wonders which mountainous regions exhibit; and perhaps there is no *terrestrial* scene which presents, at one view, so many objects of overpowering magnitude and grandeur, and which inspires the mind with so impressive an idea of the power of that Almighty Being who "weighs the mountains in scales and the hills in a balance."

Mountains serve a variety of useful purposes. Their lofty summits are destined by Providence to arrest the vapours which float in the regions of the air; their internal cavities form so many spacious basins for the reception of water distilled from the clouds; they are the original source of springs and rivers, which water and fertilize the earth; they form immense magazines, in which are deposited stones, metals, and minerals, which are of so essential service in the arts that promote the comfort of human life; they serve for the production of a vast variety of herbs and trees; they arrest the progress of storms and tempests; they afford shelter and entertainment to various animals which minister to the wants of mankind: in a word, they adorn and embellish the face of nature; they form thousands of sublime and beautiful landscapes, and afford from their summits the most delightful prospects of the plains below. All these circumstances demonstrate the wisdom of the Great Architect of nature, and lead us to conclude, that mountains, so far from being rude excrescences, form an essential part in the constitution, not only of our globe, but of all habitable worlds. DICK—*Christian Philosopher.*

THIRTY YEARS AGO.

THIRTY years ago there were many hundred millions of human beings alive who are now dead. It requires not the aid of inspiration to foretel the same catastrophe;

respecting hundreds of millions now living, in thirty years to come.

Thirty years ago the slave-trade was a lawful, honourable, humane, and Christian occupation. It is now piracy, and persons engaged in it are liable to be "hanged by the neck until dead" at the yard-arm. Human laws are ever varying—justice is eternal. Slavery itself is *now* as lawful, honourable, and Christian a thing as the slave-trade was then; but there are some signs of the times which afford a hope that, by a natural demise, a legal execution, or actual suicide, our colonies will be rid of this curse in thirty years to come.

Thirty years ago Buonaparte was not known, except as an artillery officer in the French army. His campaigns in Italy, Germany, Egypt, Syria, Poland, and Russia, his chief consulship, his imperial dignity, his abdication, his exile in Elba, his return to Paris, his overthrow at Waterloo, his imprisonment at St Helena, and his death, have all been and gone, and are as if they had never been, except in their consequences, which will not cease to be implicated with the fate of nations till the world's end. There may be a boy at school this day, who shall arrive at equal eminence of power, glory, and dominion, over the destinies of man, through life and beyond the grave, in thirty years to come.

Thirty years ago the small-pox was a perpetual pestilence, walking in darkness throughout the world wherever ships and armies, merchants or travellers, from Europe had visited. Vaccination has chased this fiend "from the rising of the sun to the going down of the same," and from the shores of Greenland to Patagonia. There will scarcely be a pock-marked face to be seen thirty years to come.

Thirty years ago there was scarcely a poet living among us except Cowper and Peter Pindar. There are now as many authors of volumes of verse as days in the year,—ay, even in leap-year,—we had almost said hours. The works of thirty of these may perhaps be remembered for thirty years to come.

Thirty years ago there were neither gas-lights, nor steam-packets, nor safety-lamps, nor life-boats, nor a hundred other useful mechanical and philosophical inventions. All these will most probably be improved beyond what can be anticipated in thirty years to come.

Thirty years ago there were neither Bible, nor Missionary, nor Tract, nor School Societies, for the instruction and conversion of heathen at home and abroad in the only true religion, of all that bear that desecrated name under heaven. There are now about fifty parent institutions of the kind, whose progeny of auxiliaries at least reach a thousand, and whose income amounts to nearly half a million sterling. It is not unreasonable to expect that these may be increased tenfold, at the least computation, during thirty years to come.

MONTGOMERY.

THE VOICE OF SPRING.

I COME, I come! ye have called me long,
I come o'er the mountains with light and song;
Ye may trace my step o'er the wakening earth,
By the winds which tell of the violet's birth,
By the primrose stars in the shadowy grass,
By the green leaves opening as I pass.

I have breathed on the South, and the chesnut-flowers,
By thousands, have burst from the forest-bowers;
And the ancient graves, and the fallen fanes,
Are veil'd with wreaths on Italian plains.
—But it is not for me, in my hour of bloom,
To speak of the ruin or the tomb!

I have pass'd o'er the hills of the stormy North,
And the larch has hung all his tassels forth,
The fisher is out on the sunny sea,
And the rein-deer bounds through the pasture free,
And the pine has a fringe of softer green,
And the moss looks bright where my step has been.

I have sent through the wood-paths a gentle sigh,
And *call'd out each voice* of the deep-blue sky,

From the night-bird's lay through the starry time,
In the groves of the soft Hesperian clime,
To the swan's wild note by the Iceland lakes,
When the dark fir bough into verdure breaks.

From the streams and founts I have loosed the chain;
They are sweeping on to the silvery main,
They are flashing down from the mountain-brows,
They are flinging spray on the forest-boughs,
They are bursting fresh from their sparry caves,
And the earth resounds with the joy of waves.

Come forth, O ye children of gladness, come!
Where the violets lie may now be your home.
Ye of the rose-cheek and dew-bright eye,
And the bounding footstep, to meet me fly,
With the lyre, and the wreath, and the joyous lay,
Come forth to the sunshine, I may not stay!

Away from the dwellings of care-worn men,
The waters are sparkling in wood and glen;
Away from the chamber and dusky hearth,
The young leaves are dancing in breezy mirth;
Their light stems thrill to the wild wood strains,
And Youth is abroad in my green domains.

MRS HEMANS.

PROPERTIES OF FREE CALORIC.

HEAT, strictly speaking, is the name of a sensation produced on animated bodies; but custom has adapted it likewise to inanimate matter; and we say, *the heat of the sun*, or *the heat of an oven*, just as readily as the *heat* which these bodies are capable of exciting. It was with a view to avoid the confusion which arose from thus confounding the cause and the effect, that modern chemists adopted the new word *caloric* to denote the principle which produces heat; and it is in this sense that the word is generally employed in modern books of science.

Caloric is supposed to be a fluid of inappreciable tenuity, which is distributed in various proportions among *the particles* of bodies; and it is called *free caloric* or *heat of temperature*, whatever be its degree, or whatever

the source whence it is derived, provided it is perceptible by the senses, or affects the thermometer.

1. *Expansive Power of Caloric.*—One of the most remarkable properties of free caloric, is its power of *dilating* bodies, or of expanding them so as to make them occupy a greater space than they did before. Its effect is directly contrary to that of the attraction of cohesion; the one drawing the particles together, the other driving them asunder; and from the continual struggle between these two forces, result all the various degrees of consistence which bodies assume, from the solid to the liquid and gaseous state. If a great quantity of caloric is added to a solid body,—in common language, if much heat is applied to it, the caloric introduces itself between the particles in such a manner as to overcome, in a considerable degree, the attraction of cohesion, and the body, from a solid, is converted into a fluid. In like manner, if caloric is added to a liquid, it forces itself between the particles, and drives them to such a distance from each other, that the attraction of aggregation is wholly destroyed, and the liquid is transformed into vapour. But each of these various states, solid, liquid, and gaseous, admits of many different degrees of density or consistence, still arising chiefly from the different quantities of caloric the bodies contain. Solids vary in density, from that of gold to that of a thin jelly; liquids from the consistence of melted glass, or melted metals, to that of ether, which is the lightest of all liquids; and the different aeriform fluids are susceptible of no less variety in their degrees of density. Nay more; every individual body admits of different degrees of consistence, even without changing its state. If a piece of iron, which, in its ordinary state, exactly fits a ring, be heated red hot, its dimensions will be so much increased by the caloric that has penetrated into it, that it will be much too large for the ring. Different bodies dilate too in very different proportions. This is the case with metals, and other kinds of solid bodies, and still more so with liquids.

It is in consequence of the great susceptibility of di-

latation in liquids, that they are used for filling thermometrical tubes. A thermometer consists of a tube, with a bulb containing a fluid, whose degrees of dilatation are indicated by a scale to which the tube is fixed. The fluid generally used for this purpose is mercury, because its dilatations and contractions are found to correspond more exactly to the additions and subtractions of caloric than those of any other fluid. The degree on the scale that indicates the boiling point, simply means, that when the mercury is sufficiently dilated to rise to this point, the heat is such, that water exposed to the same temperature will boil; and when the fluid is so much condensed as to sink to the freezing point, we are to understand, that water will freeze at that temperature. The extreme points of the scale are not the same in all thermometers, nor are the degrees always divided in the same manner. Fahrenheit's scale, which is preferred by the English, is divided into 212 degrees, in which 32° corresponds with the freezing point, and 212° with the point of boiling water. Reaumur's, which is preferred by the French, is divided only into 80 degrees, in which 0° denotes the freezing point, and 80° that of boiling water.

As liquids expand more readily than solids, so aeriform fluids are more expansible than liquids; and one circumstance respecting their dilatation deserves to be particularly noticed: they all undergo the same degree of expansion from equal augmentations of temperature, though they vary in density more than either liquids or solids. This uniformity of expansibility, extraordinary as it may appear, is readily accounted for; for if bodies owe their different susceptibilities of expansion to their various degrees of attraction of cohesion, no such difference can be expected in permanently elastic fluids, since in these the attraction of cohesion does not exist, their particles being, on the contrary, possessed of an elastic or repulsive power; they will, therefore, all be equally expanded by equal degrees of caloric.

2. Tendency to an equal Diffusion.—Free caloric al-

ways tends to diffuse itself equally; in other words, when two bodies are of different temperatures, the warmer gradually parts with its caloric to the colder, till they are both brought to the same temperature. Thus, when a thermometer is applied to a hot body it receives caloric, when to a cold one it communicates part of its own caloric, and this communication continues until the thermometer and the body arrive at the same temperature. Cold is not a positive quality, but merely the diminution of heat. When you lay your hand on a marble table you indeed feel it *positively* cold, but the cold you experience consists merely in the loss of caloric that your hand sustains whilst its temperature is being brought to an equilibrum with the marble. If you lay a piece of ice upon the table, you will find that the contrary effect will take place, the ice will be melted by the heat which it abstracts from the marble. But not only do the hotter bodies emit rays of caloric to the colder; there seems to be a reciprocal radiation among bodies. All bodies whatever appear to be constantly radiating or emitting caloric; the hotter emit it to the colder and the colder to the hotter; nor is it more extraordinary that a hot body should receive caloric from a cold one, than that a candle should send forth rays of light to the sun, which yet must necessarily happen. Bodies that are of the same temperature give out and absorb equal quantities, so that no variation of temperature is produced in them; but when one body contains more caloric than another, the exchange is always in favour of the colder body, until an equal diffusion is effected; this is the case when the marble table cools your hand, and when it melts the ice.

Different bodies (or rather surfaces) possess the power of radiating caloric in very different degrees. From a series of ingenious experiments made by Professor Leslie on this subject, it appears that black surfaces radiate most, white next, and polished surfaces the least of all. Hence it is that light-coloured clothes, in cold weather, keep us warmer than black ones; hence also a metallic *vessel preserves* the heat of the liquid within better than

one of any other materials; silver tea-pots, for instance, make better tea than those of earthenware; and hence steam-pipes, intended to convey heat to a distant apartment, are made bright in their course, but darkened at their destination. The property that different surfaces possess of radiating in different degrees may appear to be at variance with the doctrine respecting the equilibrium of caloric, in as much as it would seem to imply that those bodies which radiate most must ultimately become coldest. But it is to be recollected that the power of absorbing caloric corresponds with, and is proportionate to that of radiation; so that, in equal temperatures, bodies compensate for the loss they sustain in consequence of their greater radiation by their greater absorption.

3. *Conducting Power.*—As bodies have different powers of *radiating*, so they have also different powers of *conducting* caloric. It is, you know, the effect of the tendency of caloric to an equal diffusion, gradually to bring all bodies that are in contact to the same temperature. The fire which burns in the grate communicates its heat from one object to another till every part of the room has an equal portion of it. The book may indeed not *feel* so cold as the table on which it lies, though both are at an equal distance from the fire, and the hearth, though nearer the fire than the carpet, may *feel* the colder of the two; but if you ascertain the temperature of these several bodies by a thermometer (which is a much more accurate test than your feeling), you will find it to be exactly the same in all. But, if of the same temperature, why should they affect the sense of feeling so differently? This is owing to the property just mentioned, the different powers of bodies to *conduct* caloric. The hearth and the table feel colder than the carpet or the book, because the latter are not such good *conductors* of caloric as the former. Caloric finds a more easy passage through marble and wood than through leather and worsted; the two former will therefore absorb caloric more rapidly from the hand, and consequently give it a stronger sensation of cold than the two latter, although they are all of them really of the

same temperature. The sensation we feel in touching a cold body is in proportion, it is to be recollected, to the rapidity with which the hand yields its caloric to that body. Were the table and the book heated an equal number of degrees above the temperature of the hand, the table, which before felt the colder, would now feel the hotter of the two; for, as in the former case it took the caloric most rapidly from the hand, so now it will impart heat most rapidly to it. Thus, the marble table, which feels to us colder than the mahogany one, will prove the hotter of the two to the ice; for, if it takes heat more rapidly from our hands, which are warmer, it will give out heat more rapidly to the ice, which is colder.

The most dense bodies are, generally speaking, the best conductors of caloric. At the common temperature of the atmosphere a piece of metal will feel much colder than a piece of wood, and the latter than a piece of woollen cloth; this again will feel colder than flannel; and down, which is one of the lightest, is at the same time one of the warmest bodies. From this you will understand why silver tea-pots have always wooden handles, and why flannel clothing is so much used in variable climates. Flannel is a bad conductor of heat, and therefore prevents the heat of our bodies from escaping so rapidly as it would otherwise do. Were the atmosphere of a higher temperature than our bodies, it would be equally efficacious in keeping their temperature at the same degree, as it would prevent the free access to them of the external caloric. It is on the same principle that the plumage of birds preserves them so effectually from the influence of cold. Down is a kind of plumage peculiar to aquatic birds, and covers their chest, which is the part most exposed to the water; for though the surface of water is not of a lower temperature than the atmosphere, yet, as it is a better conductor of heat, it feels much colder; consequently the chest of the bird requires a warmer covering than any other part of its body. It is one of the *benevolent* arrangements of Providence, that *most animal* substances, especially those which form a

covering for animals, such as fur, wool, hair, skin, &c. are bad conductors of heat.

In fluids of different densities the power of conducting heat varies as well as in solids. Thus, mercury is so good a conductor, that if you dip your hand into a vessel filled with it you will scarcely believe that its temperature is the same as that of the atmosphere, it will feel so extremely cold. Air, on the contrary, is a very bad conductor; and this is a very fortunate circumstance, as it tends to preserve the heat of the body when exposed to cold weather. Indeed it is one of the many benevolent dispensations of Providence, in order to soften the inclemency of the seasons, and to render almost all climates habitable to man.

Some chemists have supposed that the particles of fluids are utterly destitute of the faculty of transmitting caloric to each other; but, though this opinion is unfounded, there can be no doubt that they possess this faculty in a small degree, and that their communication of heat to each other is very slow. This deficiency, however, is compensated to them by the faculty they possess of being agitated. The mobility of their particles, and their reciprocal independence on one another, permit them to change their places whenever they are expanded or contracted by alternations of temperature; hence the immediate effect of communicating heat to the under stratum of a fluid mass, or of abstracting it from the upper stratum, is to produce a series of intestine movements, and this intestine commotion is the means of diffusing the heat. This statement may be very satisfactorily proved by an accurate observation of what takes place when you increase the temperature of water. Fill a small phial with water, and mix with it any coloured dust of nearly the same specific gravity, such as pulverized amber, that you may judge of the internal motion of the water by that of the coloured dust it contains. Then immerse the phial in a glass of hot water, and mark the motion that takes place. You will see two currents, the one rising along the sides of the phial, the other descending in the

centre. The hot water communicates its caloric through the medium of the phial to the particles of the fluid nearest to the glass; these, being dilated, become specifically lighter, and ascend to the surface, where, parting with some of their heat to the cooler atmosphere, they are condensed, and in descending form the central current. Thus every particle is successively heated at the bottom and cooled at the surface of the liquid. The currents will move much slower as the operation continues, because the circulation of particles will at last produce an equilibrium of temperature between the liquid in the glass and that in the phial. This is just the process which water undergoes in boiling, and it affords a satisfactory proof that the distribution of caloric through fluids is materially promoted by a motion of the particles.

Intestine currents being thus so essential to the rapid diffusion of heat through a fluid mass, it follows that whatever obstructs these must obstruct also this change of temperature. Hence fluids intermingled with porous matters, such as starch, mucilage, &c. are more slowly cooled than in their pure and limpid state. Hence apple-tarts and pottages retain their heat very long, in comparison of the same bulk of water heated to the same degree and exposed to the same cool air.

GRAVES OF THE POOR.

PERHAPS, in this neglected spot, is laid
  Some heart once pregnant with celestial fire;
Hands, that the rod of empire might have sway'd,
  Or waked to ecstacy the living lyre:

But Knowledge to their eyes her ample page,
  Rich with the spoils of time, did ne'er unroll;
Chill Penury repress'd their noble rage,
  And froze the genial current of the soul.

Full many a gem of purest ray serene,
  The dark unfathom'd caves of ocean bear;
Full many a flower is born to blush unseen,
  And waste its sweetness on the desert air.

Some village Hampden, that with dauntless breast,
The little tyrant of his fields withstood;
Some mute inglorious Milton here may rest;
Some Cromwell, guiltless of his country's blood.

The applause of listening senates to command,
The threats of pain and ruin to despise,
To scatter plenty o'er a smiling land,
And read their history in a nation's eyes,

Their lot forbade: nor circumscribed alone
Their growing virtues, but their crimes confined;
Forbade to wade through slaughter to a throne,
And shut the gates of mercy on mankind;

The struggling pangs of conscious truth to hide;
To quench the blushes of ingenuous shame;
Or heap the shrine of luxury and pride
With incense kindled at the muse's flame.

Far from the madding crowd's ignoble strife,
Their sober wishes never learn'd to stray;
Along the cool sequester'd vale of life
They kept the noiseless tenor of their way.

Yet ev'n these bones, from insult to protect,
Some frail memorial still erected nigh,
With uncouth rhymes and shapeless sculpture deck'd,
Implores the passing tribute of a sigh.

Their name, their years, spelt by the unlettered muse,
The place of fame and elegy supply;
And many a holy text around she strews,
That teach the rustic moralist to die.

For who, to dumb forgetfulness a prey,
This pleasing anxious being e'er resign'd,
Left the warm precincts of the cheerful day,
Nor cast one longing lingering look behind?

On some fond breast the parting soul relies;
Some pious drops the closing eye requires;
Ev'n from the tomb the voice of Nature cries;
Ev'n in our ashes live their wonted fires.

GRAY.

A COUNTRY CLERGYMAN.

NEAR yonder copse, where once the garden smil'd,
And, still, where many a garden-flower grows wild;
There, where a few torn shrubs the place disclose,
The village-preacher's modest mansion rose.
A man he was to all the country dear,
And passing rich—with forty pounds a-year.
Remote from towns, he ran his godly race;
Nor e'er had chang'd, nor wish'd to change his place.
Unpractis'd he, to fawn or seek for power,
By doctrines fashion'd to the varying hour:
Far other aims his heart had learnt to prize,
More skill'd to raise the wretched than to rise.
His house was known to all the vagrant train;
He chid their wanderings, but reliev'd their pain.
The long-remember'd beggar was his guest,
Whose beard descending swept his aged breast;
The ruin'd spendthrift, now no longer proud,
Claim'd kindred there, and had his claims allow'd;
The broken soldier, kindly bid to stay,
Sat by his fire, and talk'd the night away;
Wept o'er his wounds, or tales of sorrow done,
Shoulder'd his crutch, and show'd how fields were won.
Pleas'd with his guests, the good man learn'd to glow,
And quite forgot their vices in their woe;
Careless their merits or their faults to scan,
His pity gave ere charity began.
Thus, to relieve the wretched was his pride;
And even his failings lean'd to virtue's side;
But, in his duty prompt at every call,
He watch'd and wept, he pray'd and felt for all;
And, as a bird each fond endearment tries
To tempt its new-fledg'd offspring to the skies,
He tried each art, reprov'd each dull delay,
Allur'd to brighter worlds, and led the way.
Beside the bed where 'parting life was laid,
And sorrow, guilt, and pain, by turns dismay'd,
The reverend champion stood. At his control,
Despair and anguish fled the struggling soul:
Comfort came down, the trembling wretch to raise,
And his *last faltering* accents whisper'd praise.

At church, with meek and unaffected grace,
His looks adorn'd the venerable place;
Truth from his lips prevail'd with double sway,
And fools, who came to scoff, remain'd to pray.
The service past, around the pious man,
With ready zeal, each honest rustic ran;
Even children follow'd with endearing wile,
And pluck'd his gown to share the good man's smile.
His ready smile a parent's warmth express'd,
Their welfare pleas'd him, and their cares distress'd;
To them, his heart, his love, his griefs were given;
But all his serious thoughts had rest in heaven.

GOLDSMITH.

WHAT A CHANGE!

THE Christian religion is the chief glory of our country; and it is impossible for an attentive and candid observer not to say that it is our greatest *public* blessing. It imperceptibly diffuses something of its genius and temper over the community—insensibly influencing the modes of thinking and course of action prevalent amongst many who disown their obligations to it—softening down the ferocity of the human character—communicating to the heart feelings of benevolence and mercy—restraining the outrages which would otherwise be committed against the laws of decorum—and shedding its mild light over the face of the moral world.

What was the condition of our country in the time of the Romans? Look back and consider;—see its ancient tribes, brave indeed, but savage—fishing in its waters, or hunting upon its mountains—their bodies painted in all the fantastic colours of barbarism—their minds still more disfigured with the stains of cruelty, impurity, and falsehood—the slaves of druidical idolatry—bending the knee to some demon—holding their wives as the slaves of their caprice and tyranny—and sacrificing the children whom God had given them at the shrine of the devil!—What is our country now? Its inhabitants are settled into *civilized* and domestic life—the sciences cultivated—

the arts advancing—industry, notwithstanding occasional stagnation, all astir—the fields waving with heavy corn—the most ingenious manufactures produced—the human intellect acknowledging but one God all-gracious and mighty—tyranny over the female sex abolished—and the cruel immolation of children altogether unknown!

How has this wonderful change been produced? By the revelation of Jesus Christ. Human society will no doubt of itself make some progress towards civilization; but civilization without Christianity is barbarism. Is China civilized, with her infants exposed to the dogs or to the vultures? Is Hindostan civilized, with her widows self-immolated with the bodies of their deceased husbands, or her aged inhabitants exposed alive by their own children on the banks of the Ganges? Are Mahommedan countries civilized, with their females kept in almost constant confinement, and made the subjects of the most intolerable capriciousness and oppression? Independently too of the wicked peculiarities which each establishes and encourages, the religion of Confucius begets the most daring injustice and selfishness—the religion of Brahma the most detestable impurity—the religion of Mohammed the most invincible sloth and tyranny. In none of the countries where a false religion prevails, can you ever find the human mind in that high and healthful condition which is necessary to the performance of any thing that is truly great or noble. Even the much-extolled nations of antiquity, although they exhibited the grandeur of intellect, did not exhibit the grandeur of morals; and it is the union of the two which alone can elevate man to that dignified station which his nature was intended to occupy. It is the gospel of Jesus Christ which has softened the human heart, saving infants and widows and parents from premature death, and the female sex from bondage. It is the gospel which keeps alive in the public mind a respect for decency and decorum. It is the gospel, which, emancipating man from the slavery of false religion, and thus communicating vigour and a right direction to his moral and intellectual energies, has

become the parent of ingenuity, industry, learning, and happiness. Search the annals of the nations of antiquity, or of any country to which the gospel is a stranger; where, amongst them, do you find any provision for the poor, any asylum for the destitute, any lazar-house for the sick, any refuge for the penitent profligate? But see these monuments of the spirit of the Christian religion scattered *throughout our* land—these trophies of her victory over the selfishness, or thoughtlessness, or cruelty of human nature! Were an ancient Greek or Roman, wrapping himself up in his scattered ashes, to rise from the dead, and to demand a proof of the blessings shed on Britain by the gospel, I would not point to the towering spires and domes of our churches, or bid him listen to the city chime on a Sabbath morn; because, though these are proofs of the interest excited in the Christian mind for the eternal welfare of mankind, they would not be suited to his state of ignorance on the subject.—I would point to our hospitals, to our infirmaries, to our penitentiaries; I would lead him to inspect our societies for clothing the naked, for visiting the destitute, for relieving the poor; and I would ask him, without fear of an answer in the affirmative, if such things were known in the cities of antiquity—in republican Athens, in imperial Rome! Would he not be struck with the contrast between what he remembers in the ancient world and what he sees in the modern world, and might I not glory in the Christian religion, which has accomplished so much for the comfort and happiness of man,—which, while other religions have tended to demoralize his nature, and to create to him misery, has ennobled his mind and poured a thousand blessings into his lot! The mountains of our country show their features as rough, and their sides more rutted, than they did two thousand years ago—its torrents flounder and foam down their rocky beds with the same violence as ever—the ocean around us, hoary with storms, precipitates itself upon our shores with equal violence as in the days of Druidism. But how changed *are the inh*abitants of that country! Fierceness and bar-

barism, and cruelty, and savage tyranny, have, like the snow before the sun, melted and disappeared before the beams of Christianity; the moral world has assumed a mild and genial aspect; a soft and beautiful verdure has overspread it; the efflorescence of Christian virtue has burst out upon it; and the ancient song has been verified,—"The winter is past, the rain is over and gone, the flowers appear on the earth, the time of the singing of the birds is come, and the voice of the turtle is heard in our land." *Leisure Hours.*

A MOONLIGHT NIGHT AT VENICE.

'Tis
A goodly night; the cloudy wind which blew
From the Levant hath crept into its cave,
And the broad moon has brightened. What a stillness!
And what a contrast with the scene I left,
Where the tall torches' glare, and silver lamps'
More pallid gleam along the tapestried walls,
Spread over the reluctant gloom which haunts
Those vast and dimly-latticed galleries
A dazzling mass of artificial light,
Which showed all things, but nothing as they were.
There Age—assaying to recall the past,
After long striving for the hues of youth
At the sad labour of the toilet, and
Full many a glance at the too faithful mirror—
Prankt forth in all the pride of ornament—
Forgot itself, and trusting to the falsehood
Of the indulgent beams, which show yet hide,
Believed itself forgotten, and was fool'd.
There Youth, which needed not, nor thought of such
Vain adjuncts, lavished its true bloom, and health,
And bridal beauty, in the unwholesome press
Of flush'd and crowded wassailers, and wasted
Its hours of rest in dreaming this was pleasure;
And so shall waste them till the sunrise streams
On sallow cheeks and sunken eyes, which should not
Have worn this aspect yet for many a year.
The music, and the banquet, and the wine—
The *garlands, the rose* odours, and the flowers—

The sparkling eyes and flashing ornaments—
All the delusion of the dizzy scene,
Its false and true enchantments—art and nature,
Which swam before my giddy eyes, that drank
The sight of beauty as the parched pilgrim's
On Arab sands the false mirage, which offers
A lucid lake to his eluded thirst—
Are gone. Around me are the stars and waters—
Worlds mirror'd in the ocean, goodlier sight
Than torches glared back by a gaudy glass;
And the great element, which is to space
What ocean is to earth, spreads its blue depths,
Softened with the first breathings of the spring;
The high moon sails upon her beauteous way,
Serenely smoothing o'er the lofty walls
Of those tall piles and sea-girt palaces,
Whose porphyry pillars, and whose costly fronts,
Fraught with the orient spoils of many marbles,
Like altars ranged along the broad canal,
Seem each a trophy of some mighty deed
Rear'd up from out the waters, scarce less strangely
Than those more massy and mysterious giants
Of architecture, those Titanian fabrics,
Which point in Egypt's plains to times that have
No other record. All is gentle: nought
Stirs rudely; but, congenial with the night,
Whatever walks is gliding like a spirit.
The tinklings of some soft guitars;—the dash
Phosphoric of the oar, or rapid twinkle
Of the far lights of skimming gondolas,
And the responsive voices of the choir
Of boatmen, answering back with verse for verse;
Some dusky shadow chequering the Rialto;
Some glimmering palace roof, or tapering spire,
Are all the sights and sounds which here pervade
The ocean-born and earth-commanding city.—
How sweet and soothing is this hour of calm! BYRON.

RHETORICAL EXTRACTS.

1. AMIDST this company stood Mr Watt of Birmingham, the man whose genius discovered the means of

multiplying our national resources to a degree perhaps even beyond his own stupendous powers of calculation and combination; bringing the treasures of the abyss to the summit of the earth—giving the feeble arm of man the momentum of an Afrite; commanding manufactures to arise, as the rod of the prophet produced water in the desert; affording the means of dispensing with that "time and tide which wait for no man;" and of sailing without that wind which defied the commands and threats of Xerxes himself. This potent commander of the elements—this abridger of time and space—this magician, whose cloudy machinery has produced a change on the world, the effects of which, extraordinary as they are, are perhaps only now beginning to be felt,—was not only the most profound man of science, the most successful combiner of powers and calculator of numbers as adapted to practical purposes—was not only one of the most generally well-informed, but one of the best and kindest of human beings. Methinks I yet see and hear what I shall never see or hear again. In his 85th year, the alert, kind, benevolent old man had his attention at every one's question, his information at every one's command. His talents and fancy ever flowed on every subject. One gentleman was a deep philologist—he talked with him on the origin of the alphabet as if he had been coeval with Cadmus; another, a celebrated critic—you would have said the old man had studied political economy and belles lettres all his life;—of science it is unnecessary to speak,—it was his own distinguished walk.

SIR W. SCOTT.

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2. IF nature has denied to Britain the fruitful vine, the fragrant myrtle, the spontaneous soil, and the beautiful climate, she has also exempted her from the parching droughts, the deadly siroc, and the frightful tornado. If our soil is poor and churlish, and our skies cold and frowning, the serpent never lurks within the one, nor the plague within the other. If our mountains are bleak and barren, *they have, at least,* nursed within their bosoms a

race of men whose industry and intelligence have performed greater wonders, and supply a more inexhaustible fund of wealth, than all the mines of Mexico and Hindostan. If other nations furnish us with the materials of our manufactures, ours are the skill and industry that have enhanced their value a thousand-fold; ours are the capital and enterprise that have applied the great inventions of Watt and Arkwright, and made the ascendency of this little island be felt in the remotest corners of the world; ours are the vast wealth and invincible courage that subsidized the armies of Europe, and shivered the sceptre of the tyrant, at a moment when every heart seemed fainting but our own; ours, in a word, are those institutions, civil, political, and religious, that have made us the envy of surrounding nations, and raised us to a pinnacle of greatness from which nothing but intestine foes can ever thrust us down. M'DIARMID.

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3. "UNIVERSAL emancipation!" I speak in the spirit of the British law, which makes liberty commensurate with and inseparable from British soil; which proclaims even to the stranger and the sojourner, the moment he sets his foot upon British earth, that the ground on which he treads is holy, and consecrated by the genius of Universal Emancipation! No matter in what language his doom may have been pronounced;—no matter what complexion incompatible with freedom, an Indian or an African sun may have burnt upon him;—no matter in what disastrous battle his liberty may have been cloven down; no matter with what solemnities he may have been devoted upon the altar of slavery; the first moment he touches the sacred soil of Britain, the altar and the god sink together in the dust; his soul walks abroad in her own majesty; his body swells beyond the measure of his chains, that burst from around him, and he stands redeemed, regenerated, and disenthralled, by the irresistible Genius of Universal Emancipation! CURRAN.

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4. THE first great obstacle to the extinction of war is

the way in which the heart of man is carried off from its barbarities and its horrors by the splendour of its deceitful accompaniments. There is a feeling of the sublime in contemplating the shock of armies, just as there is in contemplating the devouring energy of a tempest, and this so elevates and engrosses the whole man, that his eye is blind to the tears of bereaved parents, and his ear is deaf to the piteous moan of the dying and the shriek of their desolated families.—There is a gracefulness in the picture of a youthful warrior burning for distinction in the field, and lured by this generous aspiration to the deepest of the animated throng, where, in the fell work of death, the opposing sons of valour struggle for a remembrance and a name:—and this side of the picture is so much the exclusive object of our regard, as to disguise from our view the mangled carcasses of the fallen, and the writhing agonies of the hundreds and the hundreds more who have been laid on the cold ground, where they are left to languish and to die. There no eye pities them. No sister is there to weep over them. There no gentle hand is present to ease the dying posture, or bind up the wounds, which, in the maddening fury of the combat, have been given and received by the children of one common Father. DR CHALMERS.

5. THE impression which is produced by the sight of a great waterfall is unique; unlike any of our other feelings, it makes the most giddy thoughtful, and offers many points of comparison with human life. The landmarks are permanent as the fields we live in; the waters fleeting as our breath; the plunge that they make into unknown depths like our descent into the grave; the rainbow that sits upon the abyss like our hope of immortality. There is the dread of danger, and the curiosity of hope, and the impression of the irresistible impetus by which we are borne forward, to make us feel that we too are gliding onward, though sometimes as unconscious as the bubble, to the gulf of eternity, into which the troubled waters of life discharge themselves. An immortal and

immutable condition awaits us, though we sport with what seem to be the contingencies of existence. How often are we reckless of the star that might guide, and the chart that should direct us in our voyage, while we are floating onward and onward, with accelerated velocity, to the last leap of life! It is the highest crime a man can commit against reason and revelation, if he venture to make that leap in the dark.—*Scenes in Italy*, &c.

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6. Go to your Natural Religion; lay before her Mahomét and his disciples arrayed in armour and in blood, riding in triumph over the spoils of thousands and tens of thousands who fell by his victorious sword; show her the cities which he set in flames, the countries which he ravaged and destroyed, and the miserable distress of all the inhabitants of the earth. When she has viewed him in this scene, carry her into his retirements; show her the prophet's chamber, his concubines, and wives; let her see his adultery, and hear him allege revelation and his divine commission to justify his lust and his oppression. When she is tired with this prospect, then show her the blessed Jesus, humble and meek, doing good to all the sons of men, patiently instructing both the ignorant and the perverse. Let her see him in his most retired privacies; let her follow him to the mount, and hear his devotions and supplications to God. Carry her to his table, to view his poor fare, and hear his heavenly discourse. Let her see him injured but not provoked; let her attend him to the tribunal, and consider the patience with which he endured the scoffs and reproaches of his enemies. Lead her to his cross; and let her view him in the agony of death, and hear his last prayer for his persecutors:—"Father, forgive them, for they know not what they do." When Natural Religion has viewed both, ask which is the prophet of God. SHERLOCK.

SECTION VI.

MIRACLES.

Father. Henry. Eliza.

H. You did not, father, in our last conversation, inform us what part of Christianity was to be the subject this evening.

F. I purposely omitted it, Henry, that I might ask you a question. Supposing that certain persons were to come, say from Russia, to the court of England, and declare that they were ambassadors from the emperor, with some very important communications relating to the welfare of both empires, do you think that the British ministers would receive them without further inquiry?

H. No; I think the king's ministers would ask what proofs they could give that they were sent by him?

F. Were the messengers to say, "Here are several letters and papers that were dictated by the emperor, and written by his secretaries, and here is the imperial seal affixed to every one of them;" what, do you think, Eliza, his majesty's ministers would reply to them?

E. I think if they were in the habit of receiving communications from the emperor, they would know the manner of his correspondence; at all events, if they knew the imperial seal, they would believe that they were ambassadors from his imperial majesty.

F. You are certainly right; some of our ministers might, after reading the documents, say, "This is the style of the emperor;" others might say, "We are not so well acquainted with his style, but we know this to be the imperial seal." Hence all would say, "We receive you as his accredited ambassadors, and will treat with you upon the business on account of which you are come to our royal court."

H. But what has all this, father, to do with Christianity?

F. The Scriptures, Henry, bear internal proof that they are from God, for they contain doctrines and commandments which none but the Majesty of heaven could reveal. The prophets and the apostles were like secretaries to communicate the will of God to men; and God did not send them to make known his will, and leave them merely to assert that they were sent by him. The "great salvation, at the first begun to be spoken by the Lord, was confirmed by them that heard him, God also bearing them witness both with signs and wonders, and with divers miracles and gifts of the Holy Ghost, according to his own will." Do you know what it is that constitutes a miracle?

H. I think I do. The wonderful things that our Saviour did were miracles.

F. They were; but an event is not necessarily miraculous because it appears wonderful. A miracle is a sensible suspension of the laws of nature. If we are ignorant of these laws, we cannot determine whether any particular event is or is not a suspension of them; but if, in such cases, the course of nature is understood, then we can determine whether the event we are considering is miraculous or not. For instance, when Columbus predicted an eclipse of the moon, his knowledge appeared supernatural to the Americans; but the Spaniards, who knew that the calculations of astronomers enabled Columbus to foretel the precise hour when the shadow of the earth would pass over the moon, could not have been imposed upon like the ignorant natives.

H. That is very certain.

F. The more we improve in the knowledge of nature the more certain and uniform do the laws appear by which it is regulated, extending to the noblest, and embracing the meanest of the works of creation. I dare say you remember reading, in "Evenings at Home," that Sir Isaac Newton, seeing an apple drop from a tree, was led into a train of thought which not only enabled him to *discover why* the apple fell to the ground, but to perceive *that the* same principle is constantly, though silently,

acting upon ourselves, and every thing around us; and that its operation is not confined to the earth we inhabit, but directs the motions of the heavenly bodies. Now, is it not evident, that if the Creator permitted other beings to interrupt the beautiful order he has established, this regularity of design would cease to be generally apparent?

H. Yes; I should think it would cause great confusion.

F. A departure from these general principles, therefore, cannot happen except by the command of the Author of nature; in other words, a miracle is the seal of the Almighty to the mission of his servants.

H. But then the miracles wrought must be such as the people before whom they are performed can be certain of, or else they would be in the situation of the Americans when Columbus predicted the eclipse.

F. Unquestionably; men must be *certain* that the order of nature has been violated, otherwise there is no evidence of the seal of God. For instance, Elisha caused the head of the borrowed axe to swim, 600 years before the experiments of Archimedes had instructed men how to find the specific gravity of different bodies; but, as it had always been obvious to the common sense of mankind that iron sinks in water, Archimedes himself, had he witnessed the transaction, could not have been more certain than the wood-cutter that the prophet had exerted a miraculous power. The miracles of our Saviour were, in like manner, evident to the senses. With a word he calmed the tempest, cleansed the lepers, raised the dead; he spoke, and his purpose was at once effected, showing that he possessed a control over nature, comparable to nothing but the energy of the first divine command recorded in Scripture.

E. But could men not have communicated the messages of God without working miracles?

F. They certainly could; but would men have believed them unless they could prove that God had sent them? Men might have said, "What signs do you show

that we may see and believe?" When God delivered to Moses the message he was to repeat to the Israelites and to Pharaoh, Moses said, "Behold, they will not believe me, for they will say, The Lord hath not appeared unto thee." The force of this excuse was immediately admitted, and Moses was directed, as a proof of his commission, to exhibit miraculous signs. Our Saviour, in like manner, rested his pretensions exclusively on his miracles. "If I do not the works of my Father, believe me not."

H. Were there many that saw the miracles which Moses and our Saviour wrought?

F. Yes, Henry; the whole people of Israel were witnesses of the wonders which the Lord wrought by the hand of his servant Moses in the wilderness, and the Egyptians were the reluctant witnesses of the many disastrous evils that wasted their property and afflicted their persons. The miracles of our Lord were not done in a corner; but openly before the world, in the presence of enemies as well as friends. And they were not mere displays of his Almighty power, but were of the most beneficent nature, and fitted to lead the minds of the persons who experienced them, and the spectators who saw them, to adore the love and mercy of God who sent him, to believe the doctrines which Christ taught, and to embrace him as their expected Messiah and Almighty Saviour.

E. In reading the history of the Israelites, I have often been surprised at their forgetfulness of the great things that were done for them, and especially of their regardlessness of the works of Christ.

F. Their conduct shows the infidel state of the human heart. Christ's bitterest enemies confessed that he did many miracles, but they wickedly ascribed them to the power of Satan, though the very nature of his miracles showed the absurdity of such a base insinuation.

H. Did all the Jews say that our Lord wrought miracles by the power of Satan?

F. No; there were some that said with Nicodemus, "*Rabbi,* we know that thou art a teacher come from

God, for no man can do these miracles which thou dost, except God be with him." But as a nation they would not receive him, notwithstanding the magnificent proofs of his divine mission.

H. Oh! I think if I had seen Jesus Christ, and the miracles which he did, I would have loved him as my Saviour.

F. Ah! Henry, if you do not love him and trust in him as he is described in his word, there is reason to fear, though you had seen him, and heard all that he taught, and saw all the mighty works which he did, you would not have loved him. We read of some who never saw him, and yet esteemed him precious. And the Apostle Peter, addressing them, says, "Whom having not seen ye love, in whom, though now ye see him not, yet believing, ye rejoice, with joy unspeakable and full of glory." We have the same advantages which they had, and if we believe not in him as he is revealed in the Gospel of his grace, we would not be persuaded though we had been among the number of his hearers, or the subjects of his healing power.

EFFECTS OF CALORIC.

The phenomena which accompany the passage of caloric into substances, are expansion, liquefaction, vaporization, incandescence, and combustion. These may be considered as all its effects, for the phenomena that attend its escape from them, viz. contraction, solidification of fluids, and condensation of vapour, are merely the converse of these.

1. *Expansion.*—Expansion has already been adverted to, but it is necessary to make a few additional observations. Caloric acts in opposition to the attraction of cohesion, and its effect, on entering into a body, is to remove its integrant molecules to a greater distance from one another. From these two it evidently follows, that a small addition of caloric will occasion a small expansion, and a greater *addition* a greater expansion; that whenever caloric passes out of a body, the cohesion being left

to act freely, a contraction will necessarily follow; and that caloric produces the greatest expansion in those bodies whose cohesive power is least. These inferences are fully justified by observation. Thus the force of cohesion is greatest in solids, less in liquids, and least of all in aeriform substances; the expansion of solids is trifling, that of liquids much more considerable, and that of elastic fluids far greater.

There is, however, a peculiarity in the effect of caloric upon the bulk of some fluids; namely, that at a certain temperature an increase of heat causes them to contract, and its diminution makes them expand. Of this singular exception to the general effect of caloric water is a noted example. Ice, as every one knows, swims upon the surface of water, and therefore must be lighter than it, which is a convincing proof that water, at the moment of freezing, must expand. The increase is estimated at about $\frac{1}{10}$th of its volume. The most remarkable circumstance attending this expansion is the prodigious force with which it is effected. Mr Boyle filled a brass tube, three inches in diameter, with water, and confined it by means of a moveable plug; the expansion, when it froze, took place with such violence as to push out the plug, though preserved in its situation by a weight equal to 74 pounds. This accounts for the bursting of pipes, the disruption of mounds of earth, &c. which often accompany severe frosts. But it is not merely during the act of congelation that water expands, for it begins to dilate considerably before it actually freezes.

From decisive experiments made by Dr Hope, it appears that water obeys the usual law till it has cooled to the temperature of 40° F. after which the abstraction of caloric produces an increase instead of a diminution of volume.

The cause of the expansion of water at the moment of freezing is attributed to a new and peculiar arrangement of its particles. Ice is in reality crystallized water, and, during its formation, the particles arrange themselves in *ranks and lines*, which cross each other, and consequently

occupy more space than when they were in a liquid state. This may be seen by examining the surface of water while freezing in a saucer. No very satisfactory reason can be assigned for the expansion which takes place previous to congelation. But it is supposed that the water begins to arrange itself in the order it will assume in the solid state before actually laying aside the liquid form. But whatever be the chemical cause of the expansion of water under reduction of temperature, the *final cause* is obvious. Had the case been otherwise, had water, when deprived of a portion of its caloric, become specifically heavier than it was before, the present constitution of nature would have been materially deranged, and many of our present comforts, nay, our very existence, would have been endangered. At whatever time the temperature of the atmosphere became reduced to the freezing point, the water on the surface of our rivers and lakes would have been converted into a layer of ice; this layer would have sunk to the bottom as it froze; another layer of ice would have been immediately produced, which would also have sunk to the former layer, and so on in succession, till, in the course of time, all our rivers, from the surface to the bottom, and every other portion of water capable of being frozen, would have been converted into solid masses of ice, which all the heat of summer could never have melted. We should have been deprived of most of the advantages we now derive from the liquid element, and in a short time the face of nature would have been transformed into a frozen chaos. But, in the existing constitution of things, all such dismal effects are prevented in consequence of the Creator having subjected the waters to a law contrary to that of most other fluids, by means of which the frozen water swims upon the surface, and preserves the cold from penetrating to any great depth in the subjacent fluid. How admirably then does this *exception* to the general law of nature display the infinite intelligence of the Great Contriver of all things, and his providential care for the comfort of his creatures!

2. *Liquefaction.*—All bodies are either solid, liquid, or gaseous; and the form they assume depends upon the relative force of cohesion and caloric. As it is easy to increase or diminish the quantity of caloric in any substance, it follows that the form of bodies may be made to vary at pleasure; that is, by a sufficiently intense heat every solid may be converted into a fluid, and every fluid into the aeriform state. This inference is justified by experience so far that it may safely be considered a general law. The converse ought also to be true; and, accordingly, the various gases, with the exception of three or four, have been condensed into liquids, and all liquids, except alcohol, have been solidified. The temperature at which liquefaction takes place is called the point of fusion; and that at which liquids solidify, their point of congelation. Both these points are different for different substances, but uniformly the same, *cæteris paribus*, in the same body.

The most important circumstance relative to liquefaction, is the discovery of Dr Black, that a large quantity of caloric disappears, or becomes insensible to the thermometer, during the process. If a pound of water at 32° be mixed with a pound of water at 172°, the temperature of the mixture will be intermediate between them, or 102°; but if a pound of water at 172° be added to a pound of ice at 32°, the ice will quickly dissolve, and on placing a thermometer in the mixture, it will be found to stand, not at 102°, but at 32°. In this experiment, the pound of hot water, which was originally at 172°, actually loses 140 degrees of caloric, all of which entered into the ice, and caused its liquefaction, but did not affect its temperature; and it follows, therefore, that a quantity of caloric becomes insensible during the melting of ice sufficient to raise the temperature of an equal weight of water 140 degrees of Fahrenheit. This explains the well-known fact, on which the graduation of the thermometer depends, that the temperature of *melting ice or snow* never exceeds 32° F. All the caloric

which is added becomes insensible till the liquefaction is complete.*

The explanation which Dr Black gave of these phenomena constitutes what is called his doctrine of *latent heat*. He considered that caloric loses its property of acting on the thermometer, in consequence of combining chemically with the solid substance, and that liquefaction is the result of this combination.

The disappearance of sensible caloric in liquefaction is the basis of many artificial processes for producing cold. All of them are conducted on the principle of liquefying solid substances without the aid of heat. For the caloric necessary to produce fluidity being then derived chiefly from that which had previously existed within the solid itself in a sensible state, the temperature necessarily falls. The degree of cold thus produced depends upon the quantity of caloric which disappears, and this again is dependent on the quantity of solid liquefied, and the rapidity of liquefaction. The most common method of producing cold is by mixing together equal parts of snow and salt. The salt causes the snow to melt by reason of its affinity for water, and the water dissolves the salt, so that both of them become liquid. The cold thus generated is 32 degrees below the temperature of freezing water; that is, a thermometer placed in the mixture would stand at zero. This is the way originally proposed by Fahrenheit for determining the commencement of his scale.

3. *Vaporization.*—Aeriform substances are commonly divided into vapours and gases. The character of the

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* As so much heat disappears during liquefaction, it follows that caloric must be absorbed when a liquid passes into a solid. This may easily be proved. The temperature of water in the act of freezing never falls below 32° F. though it be exposed to an atmosphere in which the thermometer is at zero. It is obvious that the water can preserve its temperature in a medium so much colder than itself, only by the caloric which it loses being instantly supplied; and it is no less clear that the only source of supply is the caloric that was insensible in the fluid. Further, if pure recently-boiled water be cooled very slowly, and kept very tranquil, its temperature may be lowered to 21° F. without any ice being formed; but the least motion causes it to congeal suddenly; and in doing so its temperature rises to 32° F.

former is, that they can be readily converted into liquids or solids, either by a moderate increase of pressure or by a diminution of temperature. Gases, on the contrary, retain their elastic state more obstinately; they are always such at common temperatures, and cannot be made to change their form, except by being subjected to much greater pressure than they are naturally exposed to. Caloric appears to be the cause of vaporization, as well as of liquefaction, and it is a general opinion that a sufficiently intense heat would convert every liquid and solid into vapour, though a considerable number of bodies resist the strongest heat of our furnaces without vaporizing. The disposition of different substances to form vapour is very different; and the difference depends doubtless on the relative power of cohesion with which they are endowed. Fluids are, in general, more easily vaporized than solids, as would be expected from the weaker cohesion of the former. Some solids, as arsenic and salammoniac, pass at once into vapour without being liquefied; but most of them become liquid before assuming the elastic condition. Vaporization is conveniently studied under two heads, Ebullition or Boiling, and Evaporation. In the first, the production of vapour is so rapid that its escape gives rise to a visible commotion in the liquid; in the second, it passes off quietly and insensibly.

1. The temperature at which vapour rises with sufficient freedom for causing the phenomena of ebullition, is called the boiling point. The heat requisite for this effect varies with the nature of the fluid. Thus, sulphuric ether boils at 96° F., alcohol at 173°, and pure water at 212°; while oil of turpentine must be raised to 316°, and mercury to 660°, before either exhibits marks of ebullition. Even the boiling point of the same liquid is liable to be affected by several circumstances. The nature of the vessel has some influence upon it. Thus, pure water boils precisely at 212° in a metallic vessel, and at 214° in one of glass. It is likewise affected by the presence of foreign particles. But the circumstance

which has the greatest influence is variation of pressure. All bodies upon the earth are constantly exposed to considerable pressure; for the atmosphere itself presses with a force equivalent to a weight of 15 pounds on every square inch of surface. Liquids are exposed to this pressure as well as solids, and their tendency to take the form of vapour is very much counteracted by it. In fact, they cannot enter into ebullition at all till their particles have acquired such an elastic force as enables them to overcome the pressure upon their surfaces; that is, till they press against the atmosphere with the same force as the atmosphere against them. The only time at which the pressure of the atmosphere is equal to a weight of 15 pounds on every square inch of surface, is when the barometer stands at 30 inches, and then only does water boil at 212° F. If the pressure be less, that is, if the barometer fall below 30 inches, then the boiling point of water, and every other liquid, will be lower than usual; or, if the barometer rises above 30 inches, the temperature of ebullition will be proportionally increased. This is the reason why water boils at a lower temperature on the top of a hill than in the valley beneath it; for as the column of air diminishes in length as we ascend, its pressure must likewise suffer a proportional diminution. The ratio between the depression of the boiling point and the diminution of the atmospherical pressure is so exact, that it has been proposed as a method for determining the heights of mountains. An elevation of 530 feet makes a diminution of one degree of Fahrenheit. The influence of the atmosphere over the point of ebullition is best shown by removing its pressure altogether. Fluids boil in vacuo at a temperature 140 degrees lower than in the open air. Thus water boils at 72° F, alcohol at 33°, and ether at —44°. This proves that a liquid is not necessarily hot because it boils.

Water cannot be heated under common circumstances beyond 212° F., because it then acquires such an expansive force as enables it to overcome the atmospheric pressure, and to fly off in the form of vapour. But if

subjected to sufficient pressure, it may be heated to any extent without boiling. This is done by heating water while confined in a strong copper vessel, called Papin's Digester. A large quantity of vapour collects above the water, which checks the ebullition by the pressure it exerts upon the surface of the liquid. There is no limit to which water might not be heated in this way, provided the vessel is strong enough to confine the vapour; but the expansive force of steam under these circumstances is so enormous as to overcome the greatest resistance. In estimating the power of steam, it should be remembered that vapour, if separated from the liquid which produced it, does not possess a greater elasticity than an equal quantity of air. If, for example, the digester was full of steam at 212°, no water in the liquid state being present, it may be heated to any degree, even to redness, without danger of bursting. But if water be present, then each addition of caloric causes a fresh portion of steam to rise, which adds its own elastic force to that of the vapour previously existing; and in consequence an excessive pressure is soon exerted against the inside of the vessel. The elasticity of steam is employed as a moving power in the steam-engine, the construction of which depends on two properties of steam, namely, the expansive force communicated to it by caloric, and its ready conversion into water by cold.*

* The effect of both these properties is well shown by a little instrument devised by Dr Wollaston. It consists of a cylindrical glass tube, six inches long, nearly an inch wide, and blown out into a little ball at one end. A piston is accurately fitted to the cylinder, so as to move up and down the tube with freedom. When the piston is at the bottom of the tube, it is forced up by causing a portion of water, previously placed in the ball, to boil by means of a spirit-lamp. On dipping the ball into cold water, the steam which occupies the cylinder is suddenly condensed, and the piston is forced down by the pressure of the air above it. By the alternate application of heat and cold, the same movements are reproduced, and may be repeated for any length of time. The moving power of the steam-engine is the same as in this apparatus. The only essential difference between them is in the mode of condensing the steam. In the steam-engine, the steam is condensed *in a separate* vessel, where there is a regular supply of cold water for *the purpose*. By this contrivance, which constitutes the great improve*ment of* Watt, the temperature of the cylinder never falls below 212°.

The formation of vapour is attended, like liquefaction, with a loss of sensible caloric. This is proved by the well-known fact, that the temperature of steam is precisely the same as that of the boiling water from which it rises; so that all the caloric which enters into the liquid is solely employed in converting a portion of it into vapour, without affecting the temperature of either in the slightest degree, provided the latter is permitted to escape with freedom. The caloric which then becomes latent is again set free when the vapour is condensed into water.

2. *Evaporation* as well as ebullition consists in the formation of vapour, and the only assignable difference between them is, that the one takes place quietly, the other with the appearance of boiling. Evaporation takes place at common temperatures, as may be proved by exposing water in a shallow vessel to the air for a few days, when it will gradually diminish, and at last disappear entirely. Most fluids, if not all of them, are susceptible of this gradual dissipation; and it may also be observed in some solids, as, for example, in camphor. Evaporation is much more rapid in some fluids than in others, and it is always found that those liquids whose boiling point is lowest evaporate with the greatest rapidity. Thus alcohol, which boils at a lower temperature than water, evaporates also more freely; and ether, whose point of ebullition is yet lower than that of alcohol, evaporates still more rapidly.

The chief circumstances that influence the process of evaporation are extent of surface, and the state of the air as to temperature, dryness, stillness, and density. The effect of heat in promoting it may easily be shown by putting an equal quantity of water into two saucers, one of which is placed in a warm the other in a cold situation. The former will be quite dry before the latter has suffered an appreciable diminution. When water is covered by a stratum of dry air, the evaporation is rapid even when its temperature is low; whereas it goes on very tardily if the atmosphere contains much vapour, even

though the air be very warm. It is far slower in still air than in a current, because the air immediately in contact with the water soon becomes moist, and thus puts a check to it. Pressure too has a remarkable influence over it. This is easily proved by placing ether in the vacuum of an air-pump, when vapour rises so abundantly as to produce ebullition.

As a large quantity of caloric passes from a sensible to an insensible state during the formation of vapour, it follows that cold should be generated by evaporation. Water placed under the exhausted receiver of an air-pump, evaporates with great rapidity, and so much cold is generated as would freeze the water, did the vapour continue to rise for some time with the same velocity. But the vapour itself soon fills the vacuum, and retards the evaporation by pressing upon the surface of the water. This difficulty may be avoided by putting under the receiver a substance, such as sulphuric acid, which has the property of absorbing watery vapour, and consequently of removing it as quickly as it forms. Such is the principle of Mr Leslie's method for freezing water by its own evaporation.

The presence of watery vapour in the atmosphere is owing to evaporation. All the accumulations of water upon the surface of the earth are subjected by its means to a natural distillation; the impurities with which they are impregnated remain behind, while the pure vapour ascends into the air, gives rise to a multitude of meteorological phenomena, and after a time descends again upon the earth as rain. And as evaporation goes on to a certain extent even at low temperatures, it is probable that the atmosphere is never absolutely free of vapour.

Abridged from TURNER'S *Elements of Chemistry.*

THE SAXON AND THE GAEL.—*The Interview.*

THE early beam, so fair and sheen,
Was twinkling through the hazel screen,
When, rousing at its glimmer red,
The warriors left their lowly bed,

Look'd out upon the dappled sky,
Mutter'd their soldier-matins by,
And then awak'd their fire to steal,
As short and rude, their soldier-meal.
That o'er, the Gael around him threw
His graceful plaid of varied hue,
And, true to promise, led the way,
By thicket green and mountain grey.

At length they came where, stern and steep,
The hill sinks down upon the deep.
Here, Vennachar in silence flows,
There, ridge on ridge, Benledi rose;
Ever the hollow path twined on
Beneath steep bank and threatening stone;
An hundred men might hold the post,
With hardihood, against a host.
So toilsome was the road to trace,
The guide abating of his pace,
Led slowly through the pass's jaws,
And ask'd Fitz-James, by what strange cause
He sought these wilds, traversed by few,
Without a pass from Roderick Dhu.

"Brave Gael, my pass, in danger tried,
Hangs in my belt, and by my side:
Yet, sooth to tell," the Saxon said,
"I dream'd not now to claim its aid,
When here, but three days since, I came,
Bewildered in pursuit of game,
All seemed as peaceful and as still
As the mist slumbering on yon hill;
Thy dangerous Chief was then afar,
Nor soon expected back from war."—
"Yet why a second venture try?"—
"A warrior thou and ask me why!—
Moves our free course by such fix'd cause,
As gives the poor mechanic laws?
Enough, I sought to drive away
The lazy hours of peaceful day."
"Thy secret keep, I urge thee not;—
Yet, ere again ye sought this spot,
Say, heard ye nought of Lowland war,
Against Clan-Alpine waged by Mar?"—

"No, by my word;—of bands prepared
To guard King James's sports I heard;
Nor doubt I aught but when they hear
This muster of the mountaineer,
Their pennons will abroad be flung,
Which else in Doune had peaceful hung."—
"Free be they flung! for we were loth
Their silken folds should feast the moth.
Free be they flung! as free shall wave
Clan-Alpine's pine in banner brave.
But, stranger, peaceful since you came,
Bewilder'd in the mountain game,
Whence the bold boast by which you show
Vich-Alpine's vow'd and mortal foe?"
"Warrior, but yester-morn, I knew
Nought of thy chieftain, Roderick Dhu,
Save as an outlaw'd desperate man,
The chief of a rebellious clan,
Who in the Regent's court and sight,
With ruffian dagger stabb'd a knight;
Yet this alone might from his part
Sever each true and loyal heart."—

Wrathful at such arraignment foul,
Dark lower'd the clansman's sable scowl.
A space he paus'd, then sternly said,—
"And heard'st thou why he drew his blade?
Heard'st thou that shameful word and blow
Brought Roderick's vengeance on his foe?
What reck'd the chieftain if he stood
On Highland heath, or Holy-Rood?
He rights such wrong where it is given,
If it were in the court of Heaven!"—
"Still was it outrage;—yet 'tis true
Not then claim'd sovereignty his due;
While Albany, with feeble hand,
Held borrow'd truncheon of command,
The young King, mew'd in Stirling tower,
Was stranger to respect and power.
But then, thy chieftain's robber life!—
Winning mean prey by causeless strife,
Wrenching from ruin'd Lowland swain
His herds and harvests rear'd in vain,—

Methinks a soul, like thine, should scorn
The spoils from such foul foray borne."

"Saxon, from yonder mountain high,
I mark'd thee send delighted eye,
Far to the south and east, where lay,
Extended in succession gay,
Deep waving fields and pastures green,
With gentle slopes and groves between:—
These fertile plains, that soften'd vale,
Were once the birthright of the Gael;
The stranger came with iron hand,
And from our fathers reft the land.
Where dwell we now? See, rudely swell
Crag over crag, and fell o'er fell,
Ask we this savage hill we tread,
For fatten'd steer or household bread;
Ask we for flocks these shingles dry,
And well the mountain might reply,—
'To you, as to your sires of yore,
Belong the target and claymore!
I give you shelter in my breast,
Your own good swords must win the rest.'—
Pent in this fortress of the north,
Think'st thou we will not sally forth,
To spoil the spoiler as we may,
And from the robber rend the prey?
Ay,—while upon yon fertile plain
The Saxon rears one shock of grain;
While, of ten thousand flocks, there strays
But one along yon river's maze,—
The Gael, of plain and river heir,
Shall, with strong hand, redeem his share."

"Well, let it pass; nor will I now
Fresh cause of enmity avow,
To chafe thy mood and cloud thy brow.
Enough, I am by promise tied
To match me with this man of pride:
Twice have I sought Clan-Alpine's glen
In peace; but when I come agen,
I come with banner, brand, and bow,
As leader seeks his mortal foe.

For love-lorn swain, in lady's bower,
Ne'er panted for the appointed hour,
As I, until before me stand
This rebel Chieftain and his band."—

"Have, then, thy wish!"—he whistled shr
And he was answer'd from the hill;
Wild as the scream of the curlew,
From crag to crag the signal flew.
Instant, through copse and heath, arose
Bonnets, and spears, and bended bows;
On right, on left, above, below,
Sprung up at once the lurking foe;
From shingles grey their lances start,
The bracken-bush sends forth the dart,
The rushes and the willow-wand
Are bristling into axe and brand,
And every tuft of broom gives life
To plaided warriors arm'd for strife.
That whistle garrison'd the glen
At once with full five hundred men,
As if the yawning hill to heaven
A subterranean host had given,—
Watching their leader's beck and will,
All silent there they stood and still;
Like the loose crags whose threatening mas
Lay tottering o'er the hollow pass,
As if an infant's touch could urge
Their headlong passage down the verge.
The mountaineer cast glance of pride
Along Benledi's living side,
Then fix'd his eyes and sable brow
Full on Fitz-James—"How say'st thou no
These are Clan-Alpine's warriors true;
And, Saxon,—I am Roderick Dhu!"—

Fitz-James was brave:—Though to his
The life-blood thrill'd with sudden start,
He mann'd himself with dauntless air,
Return'd the Chief his haughty stare,
His back against a rock he bore,
And firmly placed his foot before:—
"Come one, come all! this rock shall fly
From its firm base as soon as I."—

Sir Roderick mark'd—and in his eyes
Respect was mingled with surprise,
And the stern joy which warriors feel
In foemen worthy of their steel.
Short space he stood—then waved his hand:
Down sunk the disappearing band;
Each warrior vanish'd where he stood,
In broom or bracken, heath or wood;
It seem'd as if their mother earth
Had swallow'd up her warlike birth.—
The wind's last breath had toss'd in air,
Pennon, and plaid, and plumage fair,—
The next but swept a lone hill-side,
Where heath and fern were waving wide.

Fitz-James look'd round—yet scarce believ'd
The witness that his sight received;
Sir Roderick with suspense he eyed,
And to his look the Chief replied,—
" Fear nought—nay, that I need not say—
But—doubt not aught for mine array,
Thou art my guest;—I pledged my word
As far as Coilantogle ford:
Nor would I call a clansman's brand
For aid against one valiant hand,
Though on our strife lay every vale
Rent by the Saxon from the Gael.
So move we on;—I only meant
To show the reed on which you leant,
Deeming this path you might pursue
Without a pass from Roderick Dhu."—

SIR WALTER SCOTT—*Lady of the Lake.*

The Saxon and the Gael continued.

THE COMBAT.

THE Chief in silence strode before,
And reach'd that torrent's sounding shore,
Which, daughter of three mighty lakes
From Vennachar in silver breaks,
Sweeps through the plain, and ceaseless mines
On Bochastle the mouldering lines,

Where Rome, the Empress of the World,
Of yore her eagle wings unfurl'd.
And here his course the Chieftain staid,
Threw down his target and his plaid,
And to the Lowland warrior said:—
"Bold Saxon! to his promise just,
Vich-Alpine has discharged his trust.
This murderous chief, this ruthless man,
This head of a rebellious clan,
Hath led thee safe, through watch and ward,
Far past Clan-Alpine's outmost guard.
Now man to man, and steel to steel,
A Chieftain's vengeance thou shalt feel.
See, here, all vantageless I stand,
Arm'd, like thyself, with single brand;
For this is Coilantogle ford,
And thou must keep thee with thy sword."—

The Saxon paused:—"I ne'er delay'd,
When foeman bade me draw my blade;
Nay more, brave Chief, I vow'd thy death;
Yet sure thy fair and generous faith,
And my deep debt for life preserv'd,
A better meed have well deserv'd:—
Can nought but blood our feud atone?
Are there no means?"—"No, stranger, none!
And here,—to fire thy flagging zeal,—
The Saxon cause rests on thy steel;
But thus spoke Fate by prophet bred
Between the living and the dead;
'Who spills the foremost foeman's life,
His party conquers in the strife.'"
"Then, by my word," the Saxon said,
"The riddle is already read.
Seek yonder brake beneath the cliff,—
There lies Red Murdoch, stark and stiff.
Thus Fate has solved her prophecy,
Then yield to Fate, and not to me.
To James, at Stirling, let us go,
Where, if thou wilt be still his foe,
Or if the King shall not agree
To grant thee grace and favour free,

I plight mine honour, oath, and word,
That, to thy native strengths restored,
With each advantage shalt thou stand,
That aids thee now to guard thy land."—

Dark lightning flash'd from Roderick's eye,—
" Soars thy presumption then so high,
Because a wretched kern ye slew,
Homage to name to Roderick Dhu?
He yields not, he, to man nor Fate!
Thou add'st but fuel to my hate;
My clansman's blood demands revenge;—
Not yet prepared for fight?—I change
My thought, and hold thy valour light
As that of some vain carpet-knight,
Who ill deserves my courteous care,
And whose best boast is but to wear
A braid of his fair lady's hair!"
—" I thank thee, Roderick, for the word!—
It nerves my heart, it steels my sword;
For I have sworn this braid to stain
In the best blood that warms thy vein.
Now, truce, farewell! and ruth, begone!—
Yet think not that by thee alone,
Proud Chief! can courtesy be shown;
Though not from copse, or heath, or cairn,
Start at my whistle clansmen stern;
Of this small horn one feeble blast
Would fearful odds against thee cast.
But fear not—doubt not—which thou wilt,—
We try this quarrel hilt to hilt."—
Then each at once his faulchion drew;
Each on the ground his scabbard threw;
Each look'd to sun, and stream, and plain,
As what they ne'er might see again;
Then foot, and point, and eye opposed,
In dubious strife they darkly closed.

Ill fared it then with Roderick Dhu,
That on the field his targe he threw,
Whose brazen studs, and tough bull-hide,
Had death so often dash'd aside;
For, train'd abroad his arms to wield,
Fitz-James's blade was sword and shield.

He practised every pass and ward,
To thrust, to strike, to feint, to guard;
While less expert, though stronger far,
The Gael maintain'd unequal war.
Three times in closing strife they stood,
And thrice the Saxon blade drank blood;
No stinted draught, no scanty tide,
The gushing flood the tartans dyed;
Fierce Roderick felt the fatal drain,
And shower'd his blows like wintry rain;
And, as firm rock, or castle roof,
Against the winter shower is proof,
The foe, invulnerable still,
Foil'd his wild rage by steady skill;
Till, at advantage ta'en, his brand
Forced Roderick's weapon from his hand,
And, backwards borne upon the lea,
Brought the proud Chieftain to his knee.

"Now, yield thee, or"— the Saxon said,
"Thy heart's blood, Chieftain, dyes my blade!"—
"Thy threats, thy mercy, I defy!
Let recreant yield who fears to die."—
Like adder darting from his coil,
Like wolf that dashes through the toil,
Like mountain-cat who guards her young,
Full at Fitz-James's throat he sprung;
Received, but reck'd not of a wound,
And lock'd his arms his foeman round.—
Now, gallant Saxon, hold thine own!
No maiden's hand is round thee thrown!
That desperate grasp thy frame might feel,
Through bars of brass and triple steel!—
They tug, they strain!—down, down they go,
The Gael above, Fitz-James below.
The Chieftain's gripe his throat compress'd,
His knee was planted in his breast;
His clotted locks he backward threw,
Across his brow his hand he drew,
From blood and mist to clear his sight,
Then gleam'd aloft his dagger bright!—
But hate and fury ill supplied
The stream of life's exhausted tide;

And all too late the advantage came;
To turn the odds of deadly game;
For, while the dagger gleam'd on high,
Reel'd soul and sense, reel'd brain and eye.
Down came the blow!—but in the heath
The erring blade found bloodless sheath;
The struggling foe may now unclasp
The fainting chief's relaxing grasp;
Unwounded from the dreadful close,
But breathless all, Fitz-James arose. *Id.*

VEGETABLE CLOTHING.

THE *vegetable* matters employed for clothing are chiefly of two kinds; the fibres of plants, and the downy substance in which the seeds are sometimes embedded. The fibrous or stringy texture is very prevalent in vegetables. We see it in the bark and wood of trees, in the stalks of green or herbaceous plants, and in the leaves of all. The longer parallel fibres are held together by shorter cross ones, forming a net-work, cemented by a glutinous matter. The ingenious, though but half-civilised people of Otaheite, have discovered a method of making tolerable cloth of the inner bark of certain trees, by steeping it in water, and then beating it with a wooden mallet. But the more artful way of employing vegetable fibres consists in an entire separation of them from the matter that held them together, reducing them to clean loose bundles, then twisting them into threads, and lastly interweaving them.

The plants selected in Europe for the purpose of making thread and cloth from their fibres, are chiefly flax and hemp. *Flax* (in Latin *linum*, whence the word *linen*) is an annual plant, rising on a single stalk to a moderate height, and crowned with handsome blue flowers, succeeded by globular seed-vessels. It is suffered to grow till the seeds are ripe, and is then plucked up by the hand, laid in little bundles to dry, deprived of its seed-vessels, and then put into pits of water to rot. The purpose of *this part of* the process is to dissolve a

mucilaginous matter, which holds the fibres together; and it is the most disagreeable part of the management of flax, as the smell arising from it while rotting is extremely offensive and prejudicial to the health. When the flax has lain long enough, it is taken out, washed, dried, then beaten with mallets, combed, and by various other operations so prepared, that the long fibres are got by themselves, clean and loose, in which state they are called *flax;* the shorter and coarser fibres, separated by the comb, are called *tow.* The operation of spinning, which it next undergoes, consists in drawing out, with the fingers, several of the fibres together, and twisting them. This was originally done by means of a distaff, on which the flax was fastened, and which was stuck in the girdle, while one hand of the spinner was occupied in drawing out and twisting the thread, and the other in winding it upon a reel or spindle. But this method has long given way to the use of a simple machine called a wheel, in which the twisting and winding are performed by means of a wheel turned by a treadle. Spinning has been a domestic occupation from the earliest ages; and, notwithstanding the modern use of compound machinery, the spinning of flax in the old way is still a common domestic employment. The product of spinning is thread, which is more or less fine according to the dexterity of the spinner, and the nature of the material. Some thread closer twisted than the rest is kept for needle-work, but the greater part is made up in bundles, called linen-yarn, and committed to the weaver.

Weaving may be regarded as a finer kind of matting. To perform it, the threads, which form the length of a piece of cloth, are first disposed in order, and strained by weights to a proper tightness; this is called the *warp.* These threads are divided by an instrument called a reed, into two sets, each composed of every other thread; and while, by the working of a treadle, each set is thrown alternately up and down, the cross threads, called the *woof or weft,* are inserted between them, by means of a little instrument, sharp at both ends, called a shuttle, which is

briskly shot from one of the weaver's hands to the other, placed on the opposite sides of the work, and carries the thread with it. This is the simplest kind of weaving; but numberless are the additional contrivances made for all the curious works wrought in the loom, which have been the objects of human ingenuity for many ages.

The linen fabrics are of all degrees of fineness, from coarse sheeting to cambric almost emulating a spider's web. They are brought to that extreme whiteness, which we so much admire, by the process of bleaching. This consists in their exposure to the action of the sun and air, with frequent watering, and often with the help of some acid liquor, which quickens the operation. The value that can be given to a raw material by manufacturing, is in few instances more strikingly exemplified than in the conversion of flax into Brussels lace, some of which sells for several guineas a yard. Indeed, if you look at a plant of flax growing, and then at the frill of your shirt, you cannot fail to be struck with admiration of human skill and industry.

Hemp is a much taller and stronger plant than flax. It has a square rough stalk, rising to the height of five or six feet, and sending off branches. When come to maturity, it is plucked up and laid to rot like flax. Its fibrous part consists in the bark surrounding the main stalk, within which is a hard woody part of no use. It is therefore necessary either to strip off the bark, or, by hard beating, to convert the inner matter to a dust which may fly away. Hemp undergoes the same general preparation as flax before it is consigned to the weaver; but, being of a stronger and coarser texture, it requires more labour to get the fine fibres separate from the rest. Hence it is commonly employed in the more homely manufactures; it is the principal material of sail-cloth, a fabric the strength of which is required to be proportional to the violence it has to undergo from storms and tempests; and it is equally important to navigation, from its use in making cordage; for which purpose it is taken nearly in

a raw state, and twisted into coarse twine, which is afterwards united to make rope.

Whilst the inhabitant of the northern and temperate regions is obliged to exercise much labour and contrivance in procuring his vegetable clothing from the stalks of plants, the native of the fruitful south enjoys the benefit of a material presented in greater abundance, and in a state requiring much less preparation before it is fitted for the manufacturer. This is *cotton*, a white woolly substance contained in the seed-pod of a family of plants, some of which are annual and herbaceous, others perennial and shrubby. In the southern parts of Persia, the shrubby kinds grow wild; but the cultivated cotton, both in the East and West Indies, in Lesser Asia, and in some of the warmer climates of Europe, is generally the herbaceous sort, produced from seed; its culture is easy, and any soil suits it when once it has taken good root. In the West Indies two crops of cotton are gathered in a year. The pods, when ripe, open of themselves, and the cotton is plucked out of them by the fingers, with the seeds sticking to it; these are separated by means of mills, which pull out and loosen the down. It is then in a state fit to be sent from the planter to the manufacturer. The farther operations it undergoes are picking, carding, and roving, which last brings off the fibres longitudinally in a continued loose line; these are next twisted and drawn out, so as to make thread or yarn, and the material is then consigned to the weaver. The vast extension of the cotton manufacture in this country has caused these preparatory operations to be performed by a system of complex machinery, the invention of the late Sir Richard Arkwright:—

First with nice eye emerging Naiads cull
From leathery pods the vegetable wool;
With wiry teeth *revolving cards* release
The tangled knots, and smooth the ravell'd fleece:
Next moves the *iron-hand*, with fingers fine,
Combs the wide card, and forms th' eternal line;

Slow, with soft lips, the *whirling can* acquires
The tender skains, and wraps in rising spires;
With quicken'd pace *successive rollers* move,
And these retain, and those extend, the rove;
Then fly the spoles, the rapid axles glow,
And slowly circumvolves the labouring wheel below.

DARWIN.

The fabrics made from cotton are probably more various and numerous than from any other material. They comprehend stuffs of all degrees of fineness, from the transparent muslin of a robe, or a turban, to the thick plush and warm bed-quilt. The commerce of Great Britain has, of late years, been peculiarly indebted to the cotton manufactory, which produces clothing for people of all ranks, from Russia to Guinea, and unites elegance with cheapness in an unrivalled degree. Great quantities of the native fabrics of the East are also imported into Europe. Some of these, from excellence in the material, and incomparable manual dexterity and patience in the workmen, though made with very simple machinery, equal in fineness and beauty any thing of European manufacture. The natives are said to perform their finest work in moist cool places under ground, which makes the cotton hold together so as to draw out to the thinnest threads; and the soft and delicate fingers of the Indian women give them the sense of feeling to a degree of nicety much beyond that of Europeans.

It is probable, that cotton at present clothes more people in the world than any other substance. Its peculiar advantage, besides cheapness, is the union of warmth with lightness, whence it is fitted for a great variety of climates. To the hot, it is better adapted than linen, on account of its absorbing quality, which keeps the skin dry and comfortable. The woolliness of cotton gives a kind of nap to the cloths made of it, which renders them soft to the touch, but apt to attract dust. In the fine muslins this is burned off, by passing them between heated cylinders, with such velocity as not to take fire, which, *considering the combustibility of cotton, must be a very nice operation.* DR. AIKIN.

NEGRO-SLAVERY.

O FOR a lodge in some vast wilderness,
Some boundless contiguity of shade,
Where rumour of oppression and deceit,
Of unsuccessful or successful war,
Might never reach me more. My ear is pain'd,
My soul is sick, with ev'ry day's report
Of wrong and outrage, with which earth is fill'd.
There is no flesh in man's obdurate heart,
It does not feel for man; the natural bond
Of brotherhood is sever'd as the flax
That falls asunder at the touch of fire.
He finds his fellow guilty of a skin
Not colour'd like his own; and having power
To enforce the wrong, for such a worthy cause
Dooms and devotes him as his lawful prey.
Lands intersected by a narrow frith
Abhor each other. Mountains interposed
Make enemies of nations, who had else
Like kindred drops been mingled into one.
Thus man devotes his brother, and destroys;
And, worse than all, and most to be deplored
As human nature's broadest, foulest blot,
Chains him, and tasks him, and exacts his sweat
With stripes, that Mercy, with a bleeding heart,
Weeps when she sees inflicted on a beast.
Then what is man? And what man, seeing this,
And having human feelings, does not blush,
And hang his head, to think himself a man?
I would not have a slave to till my ground,
To carry me, to fan me while I sleep,
And tremble when I wake, for all the wealth
That sinews bought and sold have ever earn'd.
No: dear as freedom is, and in my heart's
Just estimation prized above all price,
I had much rather be myself the slave,
And wear the bonds, than fasten them on him.
We have no slaves at home—then why abroad?
And they themselves, once ferried o'er the wave
That parts us, are emancipate and loosed.
Slaves cannot breathe in England; if their lungs

Receive our air, that moment they are free;
They touch our country, and their shackles fall.
That's noble, and bespeaks a nation proud
And jealous of the blessing. Spread it then,
And let it circulate through every vein
Of all your empire; that, where Britain's power
Is felt, mankind may feel her mercy too. COWPER.

THE SLAVE-TRADE.

'TWAS night:—his babes around him lay at rest,
Their mother slumber'd on their father's breast:
A yell of murder rang around their bed;
They woke; their cottage blazed; the victims fled;
Forth sprang the ambush'd ruffians on their prey,
They caught, they bound, they drove them fàr away;
The white man bought them at the mart of blood;
In pestilential barks they cross'd the flood;
Then were the wretched ones asunder torn,
To distant isles, to separate bondage borne,
Denied, though sought with tears, the sad relief
That misery loves,—the fellowship of grief.
The negro, spoiled of all that nature gave,
The freeborn man thus shrunk into a slave,
His passive limbs to measured tasks confined,
Obey'd the impulse of another mind;
A silent, secret, terrible control,
That ruled his sinews, and repress'd his soul.
Not for himself he waked at morning-light,
Toil'd the long day, and sought repose at night;
His rest, his labour, pastime, strength, and health,
Were only portions of a master's wealth;
His love—O, name not love, where Britons doom
The fruit of love to slavery from the womb!
Thus spurn'd, degraded, trampled, and oppress'd,
The negro-exile languish'd in the west,
With nothing left of life but hated breath,
And not a hope except the hope in death,
To fly for ever from the Creole-strand,
And dwell a freeman in his father's land.
Lives *there a savage* ruder than the slave?
—*Cruel as death,* insatiate as the grave,

False as the winds that round his vessel blow,
Remorseless as the gulf that yawns below,
Is he who toils upon the wafting flood,
A Christian broker in the trade of blood;
Boisterous in speech, in action prompt and bold,
He buys, he sells,—he steals, he kills, for gold.
At noon, when sky and ocean, calm and clear,
Bend round his bark, one blue unbroken sphere;
When dancing dolphins sparkle through the brine,
And sunbeam circles o'er the waters shine;
He sees no beauty in the heaven serene,
No soul-enchanting sweetness in the scene,
But, darkly scowling at the glorious day,
Curses the winds that loiter on their way.
When swoln with hurricanes the billows rise,
To meet the lightning midway from the skies;
When from the unburthen'd hold his shrieking slaves
Are cast, at midnight, to the hungry waves;
Not for his victims strangled in the deeps,
Not for his crimes the harden'd pirate weeps,
But grimly smiling, when the storm is o'er,
Counts his sure gains, and hurries back for more.

MONTGOMERY.

EGYPTIAN ANTIQUITIES.

1. *The Pyramids.*—We were roused, as soon as the sun dawned, with the intelligence that the Pyramids were in view. We hastened from the cabin; and never will the impression made by their appearance be obliterated. By reflecting the sun's rays, they appeared as white as snow, and of such surprising magnitude, that nothing we had previously conceived in our imagination had prepared us for the spectacle we beheld. The sight instantly convinced us, that no power of description, no delineation, can convey ideas adequate to the effect produced in viewing these stupendous monuments. The formality of their construction is lost in their prodigious *magnitude,*—the mind, elevated by wonder, feels at once *the force* of an axiom, which, however disputed, experience confirms,—that in vastness, whatsoever be its na-

ture, there dwells sublimity. Ideas of duration, almost endless;—of power, inconceivable;—of majesty, supreme;—of solitude, most awful; of grandeur, of desolation, and of repose, are all excited by the contemplation of them.

With what amazement did we survey the vast surface that was presented to us when we arrived at this artificial mountain, which seemed to reach the clouds! Here and there appeared some Arab guides upon the immense masses above us, like so many pigmies, waiting to show the way to the summit. Already some of our party had begun the ascent, and were pausing at the tremendous depth which they saw below. One of our military companions, after having surmounted the most difficult part of the undertaking, became giddy in consequence of looking down from the elevation he had attained; and, being compelled to abandon the project, he hired an Arab to assist him in effecting his descent. The rest of us, more accustomed to the business of climbing heights, with many a halt for respiration, and many an exclamation of wonder, pursued our way towards the summit. The mode of ascent has been frequently described; and yet, from the questions which are often proposed to travellers, it does not appear to be generally understood. The reader may imagine himself to be upon a staircase, every step of which, to a man of middle stature, is nearly breast high; and the breadth of each step is equal to its height: consequently the footing is secure; and although a retrospect, in going up, be sometimes fearful to persons unaccustomed to look down from any considerable elevation, yet there is little danger of falling. In some places, indeed, where the stones are decayed, caution may be required; and an Arab guide is always necessary, to avoid a total interruption; but, upon the whole, the means of ascent are such, that almost every one may accomplish it. Our progress was impeded by other causes. We carried with us a few instruments, such as our boat-compass, a thermometer, a telescope, &c.; these could not be trusted *in the hands of the* Arabs, and they were liable to be

broken every instant. At length we reached the topmost tier, to the great delight and satisfaction of all the party. Here we found a platform, thirty-two feet square, consisting of nine large stones, each of which might weigh about a ton; although they be much inferior in size to some of the stones used in the construction of this pyramid. Travellers of all ages, and of various nations, have here inscribed their names. Some are written in Greek, many in French, a few in Arabic, one or two in English, and others in Latin. We were as desirous as our predecessors to leave a memorial of our arrival; it seemed to be a tribute of thankfulness due for the success of our undertaking; and presently every one of our party was seen busied in adding the inscription of his name.

The view from this eminence amply fulfilled our expectations; nor do the accounts which have been given of it, as it appears at this season of the year, exaggerate the novelty and grandeur of the sight. All the region towards Cairo and the Delta resembled a sea, covered with innumerable islands. Forests of palm-trees were seen standing in the water; the inundation spreading over the land where they stood, so as to give them an appearance of growing in the flood. To the north, as far as the eye could reach, nothing could be discerned, but a watery surface thus diversified by plantations and by villages. To the south, we saw the Pyramids of Saccára; and upon the east of these, smaller monuments of the same kind, nearer to the Nile. An appearance of ruins might indeed be traced the whole way from the Pyramids of Djiza to those of Saccára, as if they had been once connected, so as to constitute one vast cemetery. Beyond the Pyramids of Saccára we could perceive the distant mountains of the Said. Towards the west and south-west, the eye ranged over the great Libyan Desert, extending to the utmost verge of the horizon, without a single object to interrupt the dreary horror of the landscape, except dark floating spots, caused by the shadows of passing clouds upon the sand. DR. E. D. CLARKE.

2. *Pompey's Pillar.*—Pompey's Pillar stands near the southern gate of Alexandria. It is composed of red granite. The capital, which is Corinthian, is 9 feet high. The shaft and the upper member of the base are of one piece, 90 feet long, and 9 in diameter. The base, a block of marble, 60 feet in circumference, rests on two layers of stone bound together with lead; which, however, has not prevented the Arabs from forcing out several of them, to search for an imaginary treasure. The whole column is 114 feet high. It is perfectly well polished, and only a little shivered on the eastern side. Nothing can equal the majesty of this monument; the beauty of the capital, the length of the shaft, and the extraordinary simplicity of the pedestal, excite the admiration of all travellers. This last has been somewhat damaged by the instruments of travellers curious to possess a relic of antiquity; and one of the volutes of the column was immaturely brought down, a few years ago, by a prank of some English captains, which may be related as an instance of the address and fearlessness of British sailors.

A strange freak entered into the brains of these sons of Neptune to drink a bowl of punch on the top of Pompey's Pillar! To the spot accordingly they went; and many contrivances were proposed to accomplish the desired point. But their labour was vain, until the genius who struck out the frolic happily suggested the means of performing it. A man was despatched to the city for a paper kite; and the inhabitants, apprised of what was going forward, flocked in crowds to be witnesses of the address and boldness of the English. The governor of Alexandria was told that those seamen were about to pull down Pompey's Pillar. But whether he gave them credit for their respect to the Roman warrior, or to the Turkish government, he left them to themselves, and politely answered, that the English were too great patriots to injure the remains of Pompey. He knew little, however, of the *disposition* of the people who were engaged *in this undertaking.* Had the Turkish empire risen in

opposition, it would not at that moment have deterred them. The kite was brought, and flown so directly over the pillar, that when it fell on the other side, the string lodged upon the capital. The chief obstacle was now overcome. A two-inch rope was tied to one end of the string, and drawn over the pillar by the end to which the kite was affixed. By this rope one of the seamen ascended to the top; and in less than an hour a kind of shroud was constructed, by which the whole company went up, and drank their punch amid the shouts of the astonished multitude. To the eye below, the capital of the pillar does not appear capable of holding more than one man upon it; but our seamen found it could contain no less than eight persons very conveniently. It is astonishing that no accident befell these madcaps, in a situation so elevated, that it would have turned a landman giddy in his sober senses. The only detriment which the pillar received, was the loss of the volute before-mentioned, which came down with a thundering sound, and was carried to England by one of the captains, as a present to a lady who had commissioned him for a piece of the pillar. The discovery which they made amply compensated for this mischief; as, without their evidence, the world would not have known at this hour that there was originally a statue on this pillar, one foot and ancle of which are still remaining. The statue must have been of a gigantic size, to have appeared of a man's proportion at so great a height. *Scrap Book.*

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3. *Mummy Pits.*—Gournou is a tract of rocks, about two miles in length, at the foot of the Libyan mountains, on the west of Thebes, and was the burial-place of the great city of a hundred gates. Every part of these rocks is cut out by art, in the form of large and small chambers, each of which has its separate entrance. I can truly say, it is impossible to give any description sufficient to convey the smallest idea of those subterranean abodes and their inhabitants. The suffocating air of these tombs is so great as to cause fainting. A vast

quantity of dust rises, so fine that it enters into the throat and nostrils, and chokes the nose and mouth to such a degree, that it requires great power of lungs to resist it, and the strong effluvia of the mummies. This is not all; the entry or passage where the bodies are is roughly cut in the rocks, and the falling of the sand from the upper part or ceiling of the passage causes it to be nearly filled up. In some places there is not more than a vacancy of a foot left, which you must contrive to pass through in a creeping posture like a snail, on pointed and keen stones, that cut like glass. After getting through these passages, some of them two or three hundred yards long, you generally find a more commodious place, perhaps high enough to sit. But what a place of rest! surrounded by heaps of mummies in all directions. The blackness of the wall, the faint light given by the candles or torches for want of air, the different objects that surround you, seeming to converse with each other, and the Arab guides with the candles or torches in their hands, naked and covered with dust, themselves resembling living mummies, absolutely form a scene that cannot be described. After the exertion of entering into such a place, through a passage of perhaps six hundred yards, nearly overcome, you seek a resting-place, find one, and contrive to sit; but when your weight bears on the body of an Egyptian, it crushes it like a band-box. You naturally have recourse to your hands to sustain your weight, but they find no better support; so that you sink altogether among the broken mummies, with a crash of bones, rags, and wooden cases, which raise such a dust as keeps you motionless for a quarter of an hour waiting till it subside again. Once I was conducted from such a place to another resembling it, through a passage of about twenty feet in length, and no wider than what a body could be forced through. It was choked with mummies, and I could not pass without putting my face in contact with that of some decayed Egyptian; but as the passage inclined downwards, my own weight helped me on; however, I could not avoid being covered with bones, legs, arms,

and heads, rolling from above. Thus I proceeded from one cave to another, all full of mummies piled up in various ways, some standing, some lying, and some on their heads. The purpose of my researches was to rob the Egyptians of their papyri.* The people of Gournou, who make a trade of antiquities of this sort, are very jealous of strangers, and keep them as secret as possible, deceiving travellers, by pretending that they have arrived at the end of the pits, when they are scarcely at the entrance.

BELZONI.

ADDRESS TO THE MUMMY IN BELZONI'S EXHIBITION.

AND thou hast walk'd about (how strange a story !)
   In Thebes's street three thousand years ago,
When the Memnonium was in all its glory,
   And time had not begun to overthrow
Those temples, palaces, and piles stupendous,
Of which the very ruins are tremendous.

Speak ! for thou long enough hast acted Dummy,
   Thou hast a tongue—come let us hear its tune;
Thou'rt standing on thy legs, above ground, Mummy !
   Revisiting the glimpses of the moon,
Not like thin ghosts or disembodied creatures,
But with thy bones and flesh, and limbs and features.

Tell us—for doubtless thou canst recollect—
   To whom should we assign the Sphinx's fame ?
Was Cheops or Cephrenes architect
   Of either Pyramid that bears his name ?
Is Pompey's pillar really a misnomer ?
Had Thebes a hundred gates, as sung by Homer ?

Perhaps thou wert a Mason, and forbidden
   By oath to tell the mysteries of thy trade,
Then say what secret melody was hidden
   In Memnon's statue which at sunrise play'd ?

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* *In addition to many valuable relics, Belzoni found numerous specimens of Egyptian manufactures in these subterranean abodes; some of them, such as leaf-gold, which he describes as equally thin with our own, evincing no ordinary degree of advancement in the arts.*

Perhaps thou wert a Priest—if so, my struggles
Are vain, for priestcraft never owns its juggles.

Perchance that very hand, now pinioned flat,
Has hob-a-nobb'd with Pharaoh glass to glass;
Or dropped a halfpenny in Homer's hat,
Or doffed thine own to let Queen Dido pass,
Or held, by Solomon's own invitation,
A torch at the great Temple's dedication.

I need not ask thee if that hand, when armed,
Has any Roman soldier mauled and knuckled,
For thou wert dead, and buried, and embalm'd,
Ere Romulus and Remus had been suckled:—
Antiquity appears to have begun
Long after thy primeval race was run.

Since first thy form was in this box extended,
We have, above ground, seen some strange mutations;
The Roman empire has begun and ended,
New worlds have risen—we have lost old nations,
And countless kings have into dust been humbled,
While not a fragment of thy flesh has crumbled.

Didst thou not hear the pother o'er thy head,
When the great Persian conqueror, Cambyses,
March'd armies o'er thy tomb with thundering tread,
O'erthrew Osiris, Orus, Apis, Isis,
And shook the Pyramids with fear and wonder,
When the gigantic Memnon fell asunder?

If the tomb's secrets may not be confessed,
The nature of thy private life unfold:—
A heart has throbbed beneath that leathern breast,
And tears adown that dusky cheek have rolled:—
Have children climb'd those knees and kissed that face?
What was thy name and station, age and race?

Statue of flesh—immortal of the dead!
Imperishable type of evanescence!
Posthumous man, who quitt'st thy narrow bed,
And standest undecayed within our presence,
Thou wilt hear nothing till the Judgment morning,
When the great trump shall thrill thee with its warning.

Why should this worthless tegument endure,
  If its undying guest be lost for ever?
O let us keep the soul embalmed and pure
  In living virtue, that when both must sever,
Although corruption may our frame consume,
The immortal spirit in the skies may bloom.

New Monthly Magazine.

THE WINDS.

WIND is the motion of a stream, or current of air. It may be produced by a variety of chemical and meteorological causes; but the most common cause is a partial change of temperature in the atmosphere. When any one part is more heated than the rest, that part is rarefied; the equilibrium is destroyed, and the air in consequence rises. When this happens, there necessarily follows a motion of the surrounding air towards that part, in order to restore it; this spot, therefore, receives wind from every quarter, so that those who live to the north of it experience a north wind, and those to the south a south wind. This motion occurs especially in the torrid zone, where the heat is greatest; the air being more rarefied there than in any other part of the globe, is lighter, and, consequently, ascends; whilst the air about the polar regions is continually flowing from the poles to restore the equilibrium. This motion of the air would produce a regular and constant north wind to the inhabitants of the northern hemisphere, a south wind to those of the southern hemisphere, and continual storms at the equator, did not the diurnal rotation of the earth modify it in some degree. The atmosphere accompanies the earth in its diurnal motion, and consequently travels with greater or less velocity as it is nearer the equator, or more distant from it. When, therefore, the air flows from the north or south to restore the atmospherical equilibrium at the equator, this air, not having acquired the velocity of the equatorial regions, cannot keep pace with the earth, which, travelling faster, passes through

it; and as the earth moves from west to east, this motion of the earth through the air produces a regular east wind at the equator. The winds from the north and south combine with the easterly wind about the equator, and form what are called the *trade-winds*. The composition of the two winds, north and east, produces a constant north-east wind; and that of the two winds, south and east, a regular south-east wind. These winds extend to about thirty degrees on each side of the equator, the regions farther distant from it experiencing only their respective north and south winds.

There are also periodical trade-winds, called *monsoons*, which change their course every half-year. This variation is produced by the earth's annual course round the sun, when the north pole is inclined towards that luminary one half of the year, and the south pole the other half. During the summer of the northern hemisphere, the countries of Arabia, Persia, India, and China, are much heated, and reflect great quantities of the sun's rays into the atmosphere, by which it becomes extremely rarefied, and the equilibrium consequently destroyed. In order to restore it, the air from the equatorial southern regions, where it is colder (as well as from the colder northern parts), must necessarily have a motion towards those parts. The current of air from the equatorial regions produces the trade-winds for the first six months in all the seas between the heated continent of Asia and the equator. The other six months, when it is summer in the southern hemisphere, the ocean and countries towards the southern tropic are most heated, and the air over those parts most rarefied; then the air about the equator alters its course, and flows exactly in an opposite direction. The breaking of the monsoons is the name given by sailors to the shifting of these periodical winds. They do not change their course suddenly, but by degrees, as the sun moves from one hemisphere to the other. This change is usually attended by storms and hurricanes, very dangerous for shipping; so that those seas are seldom navigated at the season of the equinox.

These remarks will explain the winds in the torrid zone; but what is it that occasions the great variety of winds which occur in the temperate zones? According to the theory, it would seem, at first sight, that there should be only north and south winds in those climates, but many causes tend to modify the general law. Since so large a portion of the atmosphere as is over the torrid zone is in continued agitation, these agitations in an elastic fluid, which yields to the slightest impression, must extend every way to a great distance. The air, therefore, in all climates, will suffer more or less perturbation, according to the situation of the country, the position of mountains, valleys, and a variety of other causes; hence it is easy to conceive, that almost every climate must be liable to variable winds. On the sea-shore there is generally a gentle sea-breeze setting in on the land on a summer's evening, to restore the equilibrium which had been disturbed by reflections from the heated surface of the shore during the day; and when night has cooled the land, and condensed the air, at the approach of morning it flows back towards the sea, producing what is called the land-breeze. All the causes that have the effect of varying the wind, cannot be enumerated; but it may be observed in general, that a change in the temperature of a column of air, the transformation of atmospheric vapours into water, their congelation, in a word, whatever causes a vacuum, a condensation, an expansion, and consequently destroys the equilibrium of the atmosphere, necessarily produces wind.

When the velocity of the wind is only two miles in the hour, it is just perceptible; at four miles it is a gentle breeze; and at thirty miles it is a high wind. When the velocity is equal to fifty miles in the hour, it is a storm or tempest; at eighty miles, it is a hurricane; and at 100 miles, the hurricane tears up trees, and levels buildings with the ground.

It is almost unnecessary to pourtray the useful and agreeable effects of which the winds are productive. They purify our atmosphere, by keeping up a perpetual

agitation in it; they dissipate the miasmata exhaled from marshes and stagnant water; they raise and transport the clouds destined to fertilize the ground by means of rain. Millions of seeds, furnished with their little pinions, ride upon the wings of the wind, and spread afar the empire of vegetation. The ingenuity of man has made a lever of the winds, which, when applied to machinery, spares him an immensity of toil. If the ocean is the highway of our globe, winds are the indefatigable coursers which rapidly transport our ships from pole to pole. Considering winds merely in a picturesque point of view, how many enjoyments do they procure to a lover of the great spectacle of nature,—above all, to the inhabitant of mountains! Sometimes they spread over every valley a curtain of clouds, which shows the summits of the far-distant Alps like so many islands scattered on the surface of an ocean; sometimes, partially drawing this curtain aside, they open to us all at once the most astonishing prospects, in which the brightest sunshine forms a happy contrast with the contiguous shades. It is to storms of wind that the painter and the traveller are indebted for the most extraordinary scenes which can meet their view. In the evenings of summer, and still more of autumn, it is the winds which, accumulating and marshalling their long trains of clouds, create and destroy before us those fugitive landscapes, those aërial mountains, which are tinged by the fires of the setting sun.

SECTION VII.

AQUEOUS VAPOUR.

It has been already mentioned, that water exposed to the air is gradually converted into a state of vapour, which, on account of its specific gravity, ascends into the atmosphere. *This* vapour presents itself in various forms.

When the air holds it in solution, it is invisible, just as salt dissolved in water is invisible; but when the air is saturated, the watery particles become visible, either in the form of clouds and mists suspended in the atmosphere, or in that of rain, dew, snow, and hail, falling to the ground.

1. *Clouds* and *mists* are referrible to the same causes, and differ only in this, that the former float in the air, whereas the latter extend along the ground. They are understood to consist of a collection of small vesicles or hollow spheres, and they consequently occupy a sort of intermediate state between water and invisible vapour. The causes that produce these vesicles are not well understood, though change of temperature and electricity have probably the principal share in the transformation. The height of clouds is very various, and seems to depend partly on electricity and partly on their specific gravity. In ascending to the summit of mountains, the traveller frequently passes through a zone of clouds, and beholds the vesicular vapours of which it is composed stretched under his feet like a vast plain covered with snow; but even on Chimborazo, the loftiest peak of the Andes, there are always to be seen, at an immense height, certain whitish clouds resembling flakes of wool. These clouds, which are perhaps many miles from the surface of the earth, are supposed to owe their elevation to negative electricity, repelling them from the ground in the same way as mists are supposed to owe their depression to positive electricity attracting them towards it.

2. *Rain* falls from the clouds when the vesicular vapour of which they are composed unites into drops. The fall of the drops of rain, after they are formed, is easily accounted for from the attraction of gravity; but the cause of the conversion of vesicular vapour into raindrops is not better understood than the cause of the conversion of vapour into vesicles, though it is highly probable that electricity is an agent in the one case as well as in the other. If the change be owing to the diminution of this fluid, we have a ready explanation of the

well-known fact, that mountainous are the most rainy countries; mountains constituting so many points for drawing off the electric fluid. This supposition is further rendered very probable by the fact, that no rain falls in those regions where thunder is unknown, as in the environs of Lima, and on the coast of Peru. Deluc observed a very elevated cloud descend with rapidity towards the earth, scatter around a violent shower of rain, and then with equal velocity remount to its original height,—a circumstance which seems confirmatory of the same hypothesis.

The quantity of rain that falls in different regions of the globe is very different. It is most abundant within the torrid zone, and decreases in proportion to the distance from the equator. The annual fall at Grenada, in 12° N. lat., is 126 inches; at Calcutta, in 22° N. lat., it is 81 inches; at Rome, in 41° 54′, it is 39 inches; in England, 32 inches; and at Petersburg, in lat. 59° 16′, it is only 16 inches. Even in different places in the same country the quantity that falls is different. At London it is only 17½ inches; at Manchester, 43 inches; at Kendal, 61 inches; at Dumfries, 36; at Glasgow, 31; and at Edinburgh, 29; but the most curious fact of all in the natural history of rain, is the difference of quantity which is collected at different heights at the same place. In one year a rain-gage on the top of Westminster Abbey received 12 inches; another on the top of a house in the vicinity received 18 inches; and a third on the surface of the ground received 22 inches.

3. *Dew*, or the moisture insensibly deposited from the atmosphere on the surface of the ground, is a well-known phenomenon. It was long supposed that its precipitation was owing to the cooling of the atmosphere towards evening, which prevented it from retaining so great a quantity of watery vapour in solution as during the heat of the day; but Dr Wells has very recently proved, that the deposition of dew is produced by the cooling of the surface of the earth, which, he has shown, takes place *previously to the cooling* of the atmosphere. The earth

is an excellent radiator of caloric, whilst the atmosphere does not possess that property, at least in any sensible degree. Towards evening, therefore, when the solar heat declines, and after sunset, when it entirely ceases, the earth rapidly cools by radiating heat towards the skies, whilst the air has no means of parting with its heat but by coming into contact with the cooled surface of the earth, to which it communicates its caloric. Its solvent power being thus reduced, it is unable to retain so large a portion of watery vapour, and deposits those pearly drops called dew. This view of the matter explains the reason why dew falls more copiously in calm than in stormy weather, and in a clear than in a cloudy atmosphere. Accumulations of moisture in the atmosphere not only prevent the free radiation of the earth towards the upper regions, but themselves radiate towards the earth; whereas, in clear nights, the radiation of the earth passes without obstacle through the atmosphere to the distant regions of space, whence it receives no caloric in exchange. The same principle enables us to explain the reason why a bottle of wine taken fresh from the cellar (in summer particularly) will soon be covered with dew. The bottle being colder than the surrounding air absorbs caloric from it; the moisture therefore which that air contained becomes visible, and forms the dew which is deposited on the bottle. In like manner, in a warm room, or in a close carriage, the inside of the windows is covered with vapour, because the window, being colder than the breath, deprives it of part of its caloric, and by this means converts it into watery vapour.

Bodies attract dew in proportion as they are good radiators of caloric, as it is this quality which reduces their temperature below that of the atmosphere. Hence we find, that little or no dew is deposited on rocks, sand, or water; while grass and living vegetables, to which it is so highly beneficial, attract it in abundance,—a remarkable instance of the wise and bountiful dispensations of Providence. The same benevolent design we may ob-

serve also in the abundance of dew in summer and in hot climates, when its cooling effects are so much required. The more caloric the earth receives during the day, the more it will radiate afterwards, and consequently the more rapidly its temperature will be reduced in the evening, in comparison to that of the atmosphere. In the West Indies, accordingly, where the intense heat of the day is strongly contrasted with the coolness of the evening, the dew is prodigiously abundant. When dew is frozen, the moment it falls it gets the name of *hoar-frost.*

4. *Snow* is another of the forms which the vapours of the atmosphere assume. It consists of aqueous vapour congealed, either while falling, or when in the air previous to falling. If we fill a deep glass, to which heat has been applied, with a saturated solution of sal ammoniac in a warm state, and then let it gradually cool in a warm air, crystals will be formed on the surface. These crystals, which are extremely minute, will sink as soon as they are formed; and they will descend slowly, because their specific gravity is not much greater than that of the liquid which contains them; at the same time their volume will be increased by the addition of similar crystals formed during their descent, so that they will reach the bottom of the vase in large white flakes. The rapid progress of this crystallization is owing to the affinity of the particles. The first crystal which begins to descend forms, as it were, a rallying point, or nucleus, to all the particles which have a tendency to unite. Snow is supposed to be formed in a similar manner. The first crystals, produced at a great height in the atmosphere, determine, as they descend, the crystallization of aqueous particles, which, without their presence, the surrounding air would retain in a state of solution. The result is the formation of hexagonal darts, or stars of six rays, when the weather is sufficiently calm, and the temperature not too high to deform the crystals by melting off their angles; but when the atmosphere is agitated, and the

snow falls from a great height, the crystals clash together, unite in groups, and form irregular flakes.

5. *Hail*, according to all appearance, is a species of snow, or of snowy rain, which has undergone a variety of congelations and superficial meltings in its passage through different zones of the atmosphere, of different temperatures. Its formation evidently depends upon electricity. It is by an electrical apparatus that we can produce artificial hail; and it is well known that volcanic eruptions are often followed by the fall of hailstones of enormous size. The violence with which hail is discharged upon the earth, under an oblique angle, and independently of the wind, would be explained by supposing, with the celebrated Volta, two electrical clouds drawn towards each other in a vertical direction, and by their shock producing hail, which, by the law of the composition of forces, would then be projected in the diagonal of the two directions of the clouds.

Such are the principal circumstances which natural philosophy has supposed to concur in the formation of aqueous meteors. Their beneficial influence upon the earth is a point more easy to determine. We observe all nature languish when the atmosphere retains for too long a time the moisture arising from the earth. Plants fade and droop; animals feel their strength failing them; man himself, breathing nothing but dust, can with difficulty procure shelter from the sultry heat, by which his frame is parched and overpowered: but scarcely have the waters of heaven descended from the clouds, when all living beings begin to revive; the fields resume their green attire, the flowers their lively tints, animals the sportive freedom of their motions, and the elements of the air their healthful equilibrium. Snow itself, whose very name alarms the natives of the tropics, is productive of real advantages in the economy of nature; it secures the roots of plants against the effects of intense cold; it serves gently to moisten those lands from which, owing to their local situation, the rain is too soon carried

off; and it paves for the inhabitant of the north commodious and agreeable roads, along which he gaily skims in his light and nimble sledge. Hail alone, of all the aqueous meteors, never appears but as a harbinger of distress. Birds and quadrupeds instinctively conceal themselves as soon as they have any presentiment of its coming. Man can neither foresee its approach, nor arrest its ravages; he has been able to ward off the thunderbolts of the sky, but he sees the hail destroy his corn, break his fruit-trees, and shatter the very house where he dwells, without being able to prevent it.

ASPIRATIONS OF YOUTH.

HIGHER, higher, will we climb,
  Up the mount of glory,
That our names may live through time
  In our country's story;
Happy, when her welfare calls,
He who conquers, he who falls.

Deeper, deeper, let us toil
  In the mines of knowledge;
Nature's wealth and Learning's spoil,
  Win from school and college;
Delve we there for richer gems
Than the stars of diadems.

Onward, onward, may we press
  Through the path of duty;
Virtue is true happiness,
  Excellence true beauty:
Minds are of celestial birth,
Make we then a heaven of earth.

Closer, closer, let us knit
  Hearts and hands together,
Where our fireside comforts sit,
  In the wildest weather;—
O, they wander wide who roam
For the joys of life from home.

MONTGOMERY.

THE BETTER LAND.

"I HEAR thee speak of the better land;
Thou call'st its children a happy band:
Mother! O where is that radiant shore?—
Shall we not seek it, and weep no more?—
Is it where the flower of the orange blows,
And the fire-flies dance through the myrtle boughs?"
"Not there, not there, my child!"

"Is it where the feathery palm-trees rise,
And the date grows ripe under many skies?—
Or 'midst the green islands on glittering seas,
Where fragrant forests perfume the breeze,
And strange bright birds, on their starry wings,
Bear the rich hues of all glorious things?"
"Not there, not there, my child!"

"Is it far away, in some region old,
Where the rivers wander o'er sands of gold?—
Where the burning rays of the ruby shine,
And the diamond lights up the secret mine,
And the pearl gleams forth from the coral strand,
Is it there, sweet mother, that better land?"
"Not there, not there, my child!—

"Eye hath not seen it, my gentle boy!
Ear hath not heard its deep songs of joy;
Dreams cannot picture a world so fair—
Sorrow and death may not enter there:
Time doth not breathe on its fadeless bloom;
For beyond the clouds, and beyond the tomb,
It is there, it is there, my child!"

MRS HEMANS.

THE GUNPOWDER TREASON.

"THE Gunpowder Plot
Shall never be forgot
While Edinburgh Castle
Can fire a single shot."

—So sang a little boy that came hopping along Prince's *Street,* on the 5th of November; and no sooner had he *passed* me, than the anniversary of the discovery of the

treason, alluded to in this doggerel verse, was announced by a salute from the castle. My mind was naturally turned to that day two hundred years back, when the horrible conspiracy against the welfare of my native country was so happily detected. I thought of the inventive villany of Catesby and his fellow-traitors; the secrecy with which they carried on their operations,—the mysterious letter sent to Lord Monteagle, warning him against going to the house on the day of the intended explosion,—the communication by him of that letter to King James and his government,—the search which followed,—the apprehension of the daring Fawkes,—the discovery of the whole project,—the consternation, flight, and death of the traitors.

Were these things so? was the first question that occurred to my mind. Could such a broad and almost unparalleled scheme of wickedness, contemplating the death of the sovereign of England, and the simultaneous extermination of almost all the rank of the country, be devised and prosecuted so far? It is but too true. It is recorded in the histories of the time. Besides, how could this day have been kept as an anniversary had the event, which it is intended to commemorate, never occurred?

This last consideration struck me as a peculiarly forcible demonstration of the truth of the alleged fact. I saw, in the waving standard of England heisted on the battlements of the fortress opposite to me,—I heard in the thunder of the cannonade which had been reverberated by the surrounding hills,—I witnessed in the partial cessation from public business,—in the doggerel verse I had heard sung on the street,—and in a variety of other circumstances which attracted my notice,—the imperishable evidence of the truth of the discovery of the gunpowder treason. As the day of the celebration of the passover was to the Israelites a memorial of deliverance from Egyptian bondage, so was the day I speak of a memorial to me and to my country of its deliverance from popish cruelty. *If the gunpowder conspiracy had not been contemplated* and discovered, how could it have

been possible for any person to institute a day in remembrance of it, or, if he should have instituted such a day, how could he have got, not only a number of sensible men, but the whole nation to observe it year after year? I pronounced the thing to have been impossible; and I considered the returning holiday as a standing proof to posterity of the truth of the fact to which it refers.

The next Sunday was the day set apart in Edinburgh for the celebration of the Lord's Supper. I went to witness the observance of it; and the same train of reasoning again presented itself as applicable to the occasion. Here, thought I, is an ordinance kept in remembrance of the death of the Saviour of the world. I saw before me the scene at Golgotha,—the three crosses,—the three sufferers,—the hardy faces of the Roman soldiery,—the ferocious visages of the Jewish multitude,—the lot cast for the garment,—the darkness which overspread the country for three awful hours. I felt the earthquake which opened the sepulchres of the saints,—I heard the affectionate charge delivered, "Son, behold thy mother! —woman, behold thy son!"—the misinterpreted cry of anguish, "*Eli, Eli, lama sabachthani,*"—the dying words, "Father, into thy hands I commend my spirit,"—the exclamation of the centurion, "Truly this was the Son of God." What a death! It was to perpetuate the remembrance of it that the Lord's Supper was instituted; and it is an indisputable historical fact, referred to not merely in sacred writ, but in the uninspired records of the primitive ages of the Christian religion, that this feast has ever since continued to be kept.

Now, how is it possible that this ordinance could have been instituted, unless the event to which it refers had actually occurred? Had there been no such event, and no such circumstances as those which are stated to have accompanied it, how could persons have been brought to observe a feast in remembrance of them? Would they not have said, "We never heard of Jesus Christ or his *crucifixion*; we never heard of Pilate or his soldiery, of *Caiaphas* and his priests; we neither saw nor heard of

the darkness, of the earthquake, nor of the confession of the centurion; and it is an imposture to institute a feast in commemoration of things which never happened." Yes, if the doctrine had not been true, that Jesus Christ died according to the Scriptures, it would have been impossible to have established a memorial of his death.

The day was Sunday. It not only exhibited a memorial of the death of Christ,—it was itself a memorial of his resurrection. The morning of the first Christian Sabbath presented itself to my imagination. I was in Jerusalem;—a streak of light broke upon the eastern horizon,—the drowsy call of the watchman was heard from Salem's towers,—all else was silent, save where three women were hastening through the deserted streets to the outskirts of the city. I followed them;—they went to Joseph's tomb;—it was violated, the stone that covered the entrance was rolled away, and instead of Jesus was seen one in shining robes, who said, "Ye seek Jesus who was crucified: he is not here; he is risen. Come, see the place where the Lord lay." From that time has every seventh day been observed in commemoration of his resurrection. That such has been the case does not admit of a doubt; it is a fact recorded in the annals of heathen historians; and what does this fact prove? what but that Christ Jesus both "rose and revived?" How could any set of men, who themselves were not disposed to believe the event, and did not expect it, ever have been brought to commemorate it from week to week, if it had not been real? Would not all to whom the proposal was made have said, "We never heard of such a person as Jesus Christ, of his crucifixion and burial. Who is Joseph of Arimathea?—who the women who found the sepulchre opened?—who Peter and John, who hastened to ascertain the truth of the report that it was violated? Where are the other disciples who saw their master after that he was risen?—where the five hundred brethren by whom he was also seen? You can answer none of these questions,—you can show us none of these persons; and therefore to ask us to set apart every week a day in

honour of the alleged event, is a request which it would be a crime to grant; it would be to participate in your imposture." Such would have been the answer to any proposal of instituting the Christian Sabbath, had the events not been real to which it refers.

As surely, therefore, as the gunpowder treason is a fact, so surely are both the death and resurrection of our Saviour facts; and every returning 5th day of November is not a stronger evidence of the reality of the one, than every returning Sabbath, and every returning celebration of the Lord's Supper, are of the other.

Leisure Hours.

LIGHT.

LIGHT is similar to caloric in many of its properties. They are both emitted in the form of rays, traverse the air in straight lines, are subject to the same laws of reflection, and diminish in intensity as the square of the distance from their source. There are two kinds of light, natural and artificial; the former proceeding from the sun and stars, the latter from bodies which are strongly heated.

The solar rays come to us either directly, or indirectly in consequence of being diffused through the atmosphere and reflected. They pass freely through some solid and liquid bodies, hence called transparent, such as glass, rock-crystal, water, and many others, which, if clear, and in moderately thin layers, intercept a portion of light that is quite inappreciable when compared to the quantity transmitted. Opaque bodies, on the contrary, intercept the rays entirely, absorbing some of them and reflecting others. Though transparent substances permit the light to pass through them, they nevertheless exert a considerable influence upon it in its passage. All the rays which fall obliquely are refracted, that is, are made to deviate from their original direction. It was this property of transparent media which enabled Sir Isaac Newton to discover the compound nature of the solar light,

and to resolve it into its constituent parts. The substance commonly employed for this purpose is a triangular piece of glass called the prism. Its action depends upon the different refrangibility of the seven coloured rays which compose a colourless one. The violet ray suffers the greatest refraction, and the red the least; while the other colours of the rainbow lie between them, disposed in regular succession according to the degree of deviation which they have individually experienced. The coloured figure so produced is called the prismatic spectrum, which is always bounded by the violet ray on one side, and by the red on the other.*

The solar rays, both direct and diffused, possess the property of exciting heat as well as light; but this effect takes place only when the rays are absorbed: for the temperature of transparent substances through which they pass, or of opaque ones by which they are reflected, is not affected by them. Hence it happens that the burning-glass and concave reflector are themselves nearly or quite cool at the very moment of producing a strong heat by collecting the sun's rays into a focus. The extreme coldness that prevails in the higher strata of the air arises from the same cause. The rays pass on unabsorbed through the atmosphere; and the lower parts of it would be as cold as the upper, did they not receive caloric by communication from the earth.

The second kind of light is that which is emitted by substances when strongly heated. All bodies begin to emit light when caloric is accumulated within them in great quantity; and the appearance of glowing or shining, which they then assume, is called incandescence. The temperature at which solids in general begin to shine in the dark is between 600° and 700° F.; but

* The following simple experiment shows, that the seven primitive colours, when arranged in certain proportions, produce white:—Divide a circular piece of wood, as the rim of a top, into 360 equal parts; paint 45 of these parts *red*, 37 *orange*, 48 *yellow*, 60 green, 60 blue, 40 *indigo*, and 80 *violet*; then make the top spin rapidly. If the colours are pure, it will appear perfectly *white*.

they do not appear luminous in broad daylight till they are heated to about 1000° F. The colour of incandescent bodies varies with the intensity of the heat. The first degree of luminousness is an obscure red. As the heat augments, the redness becomes more and more vivid, till at last it acquires a full red glow. Should the temperature still continue to increase, the character of the glow changes, and by degrees becomes white, shining with increasing brilliancy as the intensity of the heat augments. Liquids and gases likewise become incandescent when strongly heated; but a very high temperature is required to make a gas luminous, more than is sufficient for heating a solid body even to whiteness. The different kinds of flame, as of the fire, candles, and gas-light, are instances of incandescent gaseous matter. All artificial lights are procured by the combustion or burning of inflammable matter. So large a quantity of caloric is evolved during the process, that the body is made incandescent in the moment of being consumed. Those substances are preferred for the purposes of illumination that yield gaseous products when strongly heated, which, by becoming luminous while they burn, constitute flame. The light derived from such sources differs from the solar light in being accompanied by free radiant caloric, similar to that emitted by a non-luminous heated body.

Light is emitted by some substances at common temperatures, giving rise to an appearance which is called phosphorescence. This phenomenon seems owing in some instances to a direct absorption of light which is afterwards slowly emitted. A composition, made by heating to redness a mixture of calcined oyster-shells and sulphur, known by the name of Canton's Phosphorus, possesses this property in a very remarkable degree. It shines so strongly for a few minutes after exposure to light, that, when removed to a dark room, the hour on a watch may be distinctly seen by it. After some time it ceases to be luminous, but it regains the property when exposed during a short interval to light. Phosphorescence is observed in the bodies of some animals, either in

the dead or living state. Some marine animals, and particularly fish, possess it in a remarkable degree. It may be witnessed in the body of the herring, which begins to phosphoresce a day or two after death, and before any visible sign of putrefaction has set in. Sea-water is capable of dissolving the luminous matter; and it is probably from this cause that the waters of the ocean sometimes appear luminous at night when agitated. This appearance is also ascribed to the presence of certain animalcules, which, like the glow-worm of this country, or the fire-fly of the West Indies, are naturally phosphorescent.*

TURNER—*Elements of Chemistry.*

COMPLAINT OF THE DYING YEAR.

"I AM the son of old father *Time,* and the last of a numerous progeny; for he has had upwards of five thousand of us; but it has ever been his fate to see one child expire before another was born. It is the opinion of some,

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* The science of optics, though full of interest to young readers, cannot be easily explained without the aid of diagrams. The following are some of the facts which it develops:—Light *flies* at the rate of nearly 12,000,000 miles in a minute. Objects become visible by the light which they reflect. By means of mirrors and lenses, the rays of light may be so modified as to proceed either in a *diverging, converging,* or *parallel* direction, and the images of visible objects represented in a variety of new *forms, positions,* and *magnitudes.* Every ray of white light may be separated into seven primary colours: *red, orange, yellow, green, blue, indigo,* and *violet.* The variegated colouring which appears on the face of nature is not in the objects themselves, but in the light which falls upon them. The *rainbow* is produced by the refraction and reflection of the solar rays in the drops of falling rain. The rays of light are refracted, or bent out of their course, when they fall upon glass, water, and other mediums. The light of the sun may be collected into a point or focus, and made to produce a heat more intense than that of a furnace. The rays from visible objects, when reflected from a concave mirror, converge to a focus, and paint an image of the objects before it; and when they pass through a convex glass, they depict an image behind it. On these and other principles demonstrated by this science, the camera obscura, the magic lantern, the phantasmagoria, the kaleidoscope, the heliostata, the micrometer, spectacles, opera-glasses, prisms, microscopes, reflecting and refracting telescopes, and other optical instruments, have been constructed, by means of which the natural powers of human vision have been wonderfully increased, and our prospects into the works of God extended far beyond what former ages could have conceived.

that his own constitution is beginning to break up, and that when he has given birth to a hundred or two more of us, his family will be complete, and then he himself will be no more." Thus the old year began his complaint. He then called for his account-book, and turned over the pages with a sorrowful eye. He has kept, it appears, an accurate account of the moments, minutes, hours, and months, which he has issued, and subjoined, in some places, memorandums of the uses to which they have been applied, and of the losses he has sustained. These particulars it would be tedious to detail; but we must notice one circumstance; upon turning to a certain page in his accounts, the old man was much affected, and the tears streamed down his furrowed cheeks as he examined it. This was the register of the forty-eight Sundays which he had issued; and which, of all the wealth he had to dispose of, has been, it appears, the most scandalously wasted. "These," said he, "were my most precious gifts. I had but fifty-two of them to bestow. Alas! how lightly have they been esteemed!"

"I feel, however," said he, "more pity than indignation towards these offenders, since they were far greater enemies to themselves than to me. But there are a few outrageous ones, by whom I have been defrauded of so much of my substance, that it is difficult to think of them with patience, particularly that notorious thief *Procrastination,* of whom every body has heard, and who is well known to have wronged my venerable father of much of his property. There are also three noted ruffians, *Sleep, Sloth,* and *Pleasure,* from whom I have suffered much; besides a certain busy-body called *Dress,* who, under pretence of making the most of me, and taking great care of me, steals away more of my gifts than any two of them.

"As for me, all must acknowledge that I have performed my part towards my friends and foes. I have fulfilled my utmost promise, and been more bountiful than many of my predecessors. My twelve fair children have, each in their turn, aided my exertions; and their various tastes and dispositions have all conduced to the

general good. Mild *February*, who sprinkled the naked boughs with delicate buds, and brought her wonted offering of early flowers, was not of more essential service than that rude blustering boy, *March*, who, though violent in his temper, was well-intentioned and useful.—*April*, a gentle, tender-hearted girl, wept for his loss, yet cheered me with many a smile. *June* came crowned with roses, and sparkling in sunbeams, and laid up a store of costly ornaments for her luxuriant successors. But I cannot stop to enumerate the good qualities and graces of all my children. You, my poor *December*, dark in your complexion, and cold in your temper, greatly resemble my first-born *January*, with this difference, that he was most prone to anticipation, and you to reflection.

"If there should be any, who, upon hearing my dying lamentation, may feel regret that they have not treated me more kindly, I would beg leave to hint, that it is yet in their power to make some compensation for their past conduct, by rendering me, during my few remaining days, as much service as in their power. It would give me particular pleasure to see my only surviving child treated with respect: let no one slight her offerings: she has a considerable part of my property still to dispose of, which, if well employed, will turn to good account. Not to mention the rest, there is one precious Sunday yet in her gift; it would cheer my last moments to know that this had been better prized than the past.

"It is very likely that, at least after my decease, many may reflect upon themselves for their misconduct towards me. To such I would leave it as my dying injunction, not to waste time in unavailing regret; all their wishes and repentance will not recall me to life. I would rather earnestly recommend to their regard my youthful successor, whose appearance is shortly expected. I cannot hope to survive long enough to introduce him; but I would fain hope that he will meet with a favourable reception; and that, in addition to the flattering honours which greeted my birth, and the fair promises which deceived my hopes, more diligent exertion, and more per-

severing efforts, may be expected. Let it be remembered that one honest endeavour is worth ten fair promises."

DR HENDERSON.

THE EYE.

THE eye is in form nearly globular; it consists of three coats and three humours. The part of the outward coat hid from our sight is called the *sclerotica*; the front part, which rather projects out, the *cornea*; the next within this coat is that called the *choroides*, which serves, as it were, for a lining to the other; in the front it joins with that part known by the name of the *iris*, because it is in different persons of different colours, as blue, brown, &c. The *iris* is composed of two sets of muscular fibres; the one, of a circular form, which contracts the hole in the middle called the *pupil*, when the light would otherwise be too strong for the eye; and the other of radial fibres, tending every where from the circumference of the *iris* towards the middle of the *pupil*; which, by their contraction, dilate and enlarge the *pupil*, when the light is weak, in order to admit more rays. The third coat is only a fine expansion of the optic nerve, which spreads like net-work all over the inside of the *choroides*, and is therefore called the *retina*; upon it are in a manner painted the images of all visible objects, by the rays of light which either flow or are reflected from them.

Immediately under the *cornea* is a fine transparent fluid, like water, which is therefore called the *aqueous humour*; it gives a protuberant figure to the *cornea*, and has the same limpidity and refractive power as water. At the back of this lies a humour transparent like crystal, and much of the consistence of hard jelly; it is shaped like a double convex glass, and is a little more convex on the back than on the fore part; it is named the *crystalline humour*, and is of service in converging the rays which pass through it to its focus at the bottom of the eye. This humour is enclosed in a fine transparent membrane, from which proceed radial fibres, called the ligamentum

ciliare, all around its edge, joining to the circumference of the *iris.* These fibres have a power of dilating and contracting occasionally, by which means the convexity of the *crystalline humour* is altered; and it is also thereby shifted a little backward or forward in the eye, so as to adapt its focal distance at the bottom of the eye to the different distances of objects,—a provision without which we could only see objects distinctly at one particular distance from the eye. At the back of the *crystalline* lies the *vitreous humour,* which is transparent like glass, as its name denotes, and is largest of all in quantity; filling the rest of the eye, and giving it a globular shape; it is much of the consistence of the white of an egg, its refractive power very little exceeding that of water.

As rays are emitted or reflected from every point of an object, some of these from the side next the eye will fall upon the *cornea,* and, by passing on through the *pupil* and different humours, will be converged to various points on the *retina* at the bottom of the eye, and will form upon it an inverted picture of the object; or, if this inverted image be not formed, the object cannot be seen; when, unfortunately, any of the parts of the eye are so injured as to lose their transparency, the person becomes blind.

But it is not sufficient, in order to our seeing objects, that their images should be painted on the retina; in some blind persons this takes place. The small nerves of the retina are agitated by the rays of light which form the image at the bottom of the eye; and this agitation is transmitted by the optic nerve to the brain. It is there the mental perception is formed; but the union of the soul with the body will probably for ever remain a mystery.

DR O. GREGORY.

THE EYE AND TELESCOPE COMPARED, WITH A VIEW TO THE DISCOVERY OF TRACES OF DESIGN IN THE FORMER.

THE eye and the telescope are both instruments of vision. *They are constructed* upon the same principles, both be-

ing adjusted to the laws by which the transmission and refraction of light are regulated. The lenses of the telescope, and the humours of the eye, bear a complete resemblance to one another, in their figure, their position, and in their power over the rays of light. The resemblance between the two cases is still more accurate. In dioptric telescopes there is an imperfection of this nature. Pencils of light, in passing through glass lenses, are separated into different colours, thereby tinging the object, especially the edges of it, as if it were viewed through a prism. To correct this inconvenience had been long a desideratum in the art. At last it came into the mind of a sagacious optician, to inquire how this matter was managed in the eye, in which there was exactly the same difficulty to contend with as in the telescope. His observation taught him, that in the eye the evil was cured by combining lenses composed of substances which possessed different refracting powers. Our artist borrowed thence his hint; and produced a correction of the defect, by imitating, in glasses made from different materials, the effects of the different humours through which the rays of light pass before they reach the bottom of the eye. Could this be in the eye without purpose, which suggested to the optician the only effectual means of attaining that purpose?

But, farther, there are other points, not so much perhaps of strict resemblance between the two, as of superiority of the eye over the telescope, which may furnish topics of fair and just comparison. Two things were wanted to the eye, which were not wanted (at least in the same degree) to the telescope; and these were the adaptation of the organ, first, to different degrees of light; and, secondly, to the vast diversity of distance at which objects are viewed by the naked eye.

In order to exclude excess of light, and to render objects visible under obscurer degrees of it, the hole or *aperture* in the eye, through which the light enters, is so *formed*, as to contract or dilate itself for the purpose of *admitting* a greater or less number of rays at the same

time. The chamber of the eye is a camera obscura, which, when the light is too small, can enlarge its opening; when too strong, can again contract it; and that without any other assistance than that of its own exquisite machinery. It is farther also to be observed, that this hole in the eye, which we call the pupil, under all its different dimensions, retains its exact circular shape. This is a structure extremely artificial. Let an artist only try to execute the same, he will find that his threads and strings must be disposed with great consideration and contrivance, to make a circle which shall continually change its diameter, yet preserve its form. This is done in the eye by an application of circular and radial fibres. The second difficulty was the suiting of the same organ to the perception of objects that lie near at hand, and of objects which are placed at a considerable distance. Now, rays issuing from points placed at a small distance from the eye, and which consequently must enter the eye in a spreading or diverging order, cannot, by the same optical instrument in the same state, be brought to a point in the same place with rays proceeding from objects situated at a much greater distance, and which rays arrive at the eye in directions nearly parallel. It requires a rounder lens to do it. The point of concourse behind the lens must fall critically upon the retina, or the vision is confused; yet this point, by the immutable properties of light, is carried farther back when the rays proceed from a nearer object, than when they are sent from one that is remote. A person who was using an optical instrument would manage this matter by changing, as the occasion required, his lens or his telescope; or by adjusting the distance of his glasses with his hand or his screw: but how is it managed in the eye? It is found that, by the action of certain muscles, whenever the eye is directed to a near object, three changes are produced in it at the same time, all severally contributing to the adjustment required. The cornea, or outermost coat of the eye, is rendered more round and prominent; the crystalline lens *underneath is pushed* forward; and the axis of vision, as

the depth of the eye is called, is elongated. These changes in the eye vary its power over the rays of light in such a manner and degree, as to produce exactly the effect which is wanted, viz. the formation of an image *upon the retina*, whether the rays come to the eye in a state of divergency, which is the case when the object is near to the eye, or come parallel to one another, which is the case when the object is placed at a distance. Can any thing be more decisive of contrivance than this is? The most secret laws of optics must have been known to the author of a structure endowed with such a capacity of change. It is as though an optician, when he had a nearer object to view, should *rectify* his instrument by putting in another glass, at the same time drawing out also his tube to a different length. PALEY.

WONDERS OF VISION.

LET us suppose ourselves stationed on Arthur's Seat, in the vicinity of Edinburgh. Turning our face to the north-west, the city, with its castle, spires, and stately edifices, presents itself to our view. Beyond it, on the north and west, a beautiful country, adorned with villas, plantations, and fertile fields, stretches as far as the eye can reach, till the view is bounded by the castle of Stirling, at a distance of more than thirty miles. On the right hand, we behold the port of Leith, the shipping in the roads, the coast of Fife, the isles of Inchkeith and of May, and the frith of Forth, gradually losing itself in the German ocean. If we suppose the length of this landscape to be forty miles, and its breadth twenty-five, it will, of course, comprehend an area of a thousand square miles.

The first circumstance which strikes the mind is *the immense multitude of rays of reflected light* which flow, in all directions, from the myriads of objects which compose the surrounding scene. In order to form a rude idea of this infinity of radiations, I fix my attention on a single object. I direct my eye to Nelson's monument,

on the Calton-hill. From the parapet at the top, a thousand different points send forth a thousand different cones of rays, which, entering my eye, render the different parts of it distinctly visible. How many thousands of millions, then, of different radiations, must be issuing forth every moment from the whole mass of the monument! And if one object pours forth such a flood of rays, how immense must be the number of radiations which are issuing from all the objects which compose this extensive landscape! But this is not all; these millions of rays, which flow from the minutest points of the surrounding scene, before they can produce the sensation of vision, and form a picture of the landscape on the retina, must be compressed into a space little more than one-eighth of an inch in diameter; yet they all pass through this small aperture without the least confusion, and paint the images of their respective objects in exactly the same order in which these objects are arranged. Another circumstance demands attention. The rays which proceed from the objects before me are not all directed to the spot where I stand, but are diffused throughout every point of the surrounding space, ready to produce the same effect, wherever sentient beings are present to receive them. Were the whole inhabitants of Edinburgh placed on the sloping declivity of Arthur's Seat, similar sensations would be produced, and a scene similar to that which I now behold would be depicted in every eye. Amidst the infinity of cones of light, crossing each other in an infinity of directions, no confusion would ensue, but every spectator, whose eyes were in a sound state, would obtain a correct view of the scene before him.

Let me now attend to another circumstance, no less admirable, the *distinct impression* which I have of the shape, colour, and motion, of the multiplicity of objects I am now contemplating, and the *small space* within which their images are depicted at the bottom of my eye. Could a painter, after a long series of ingenious efforts, delineate the *extensive* landscape now before me, on a *piece of paper not* exceeding the size of a silver sixpence,

so that every object might be as distinctly seen, in its proper shape and colour, as it now appears when I survey the scene around me, he would be incomparably superior to all the masters of his art that ever went before him. This effect, which far transcends the utmost efforts of human genius, is accomplished in a moment, in millions of instances, by "the finger of God." All the objects I am now surveying, comprehending an extent of a thousand square miles, are accurately delineated in the bottom of my eye, on a space *less than half an inch* in diameter. How delicate, then, must be the strokes of that Divine pencil, which has formed such a picture! I turn my eyes to the castle of Edinburgh, which appears one of the most conspicuous objects in my field of view. Supposing that portion of it which strikes my eye to be 500 feet long, and 90 in height, I find, by calculation, that it occupies only the six hundred thousandth part of the whole landscape, and, consequently fills in my eye no more than the twelve hundred thousandth part of an inch. I next direct my eye towards the frith of Forth, and perceive a steam-boat sailing between Queensferry and Newhaven. I distinctly trace its motion for the space of 40 minutes, at the end of which it reaches the chain-pier at Newhaven, having passed over a space of five miles in length, which is but the eighth part of the *lineal* extent of the landscape in that direction; and, consequently, occupies, in the picture frmed on my retina, a lineal space of only one-sixteenth of an inch in extent. And, if the boat be reckoned about 88 feet in length, its image is only the three hundredth part of this extent; and, of course, fills a space in the eye of only the four thousand eight hundredth part of a *lineal* inch. Yet, my perception of the motion of the vessel could be produced only by a corresponding motion of its image in my eye; that is, by the *gradual* motion of a point $\frac{1}{4800}$th of an inch in diameter, over a space one-sixteenth of an inch in length. How inconceivably fine and accurate, then, must be the impression of those strokes which the rays of light, from visible objects, produce on the retina of the eye! The

mind is lost in wonder when it attempts to trace so exquisite and admirable an effect.

I take a reflecting telescope, and, through it, view some of the distant parts of the landscape. My wonder is still increased, when I consider the new directions into which the rays of light are bent—the crossings and recrossings, the refractions, and reflections, that take place between the mirrors and the lenses of the instrument, and the successive images that are formed—so that, instead of a scene of confusion, which, previous to experience, might have been expected from the numerous additional bendings and intersections of the rays—I now perceive hundreds of objects, with the most perfect distinctness, which were before invisible. Rays of light from distant and minute objects, which a moment before made no sensible impression on my eye, being collected and variously modified by the telescope, now paint a vivid representation of their objects, in their true figures, colours, and positions. Surely it becomes us to join in the pious exclamation of one who had just finished a devout survey of the structure of the human frame:—"Marvellous are thy works, and that my soul knoweth right well. How precious are thy thoughts unto me, O God!" or, as the words might be rendered, "How precious are thy wonderful contrivances concerning me, O God! how great is the sum of them! If I should count them, they are more in number than the sand."

DICK—*Christian Philosopher.*

THE CAST-AWAY SHIP.*

A VESSEL sail'd from Albion's shore,
To utmost India bound,
Its crest a hero's pendant bore,
With broad sea-laurels crown'd.

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* The Blenheim, commanded by Sir T. Trowbridge, was separated from the vessels under its convoy in the Indian ocean, and never was heard of more. The same vessel, at the battle of the Nile, ran aground as it was bearing down on the enemy.

In many a fierce and noble fight,
Though foil'd on that Egyptian night,
When Gallia's host was drown'd,
And Nelson o'er his country's foes,
Like the destroying angel rose.

A gay and gallant company,
With shouts that rend the air,
For warrior-wreaths upon the sea,
Their joyful brows prepare;
But many a maiden's sigh was sent,
And many a mother's blessing went,
And many a father's prayer,
With that exulting ship to sea,
With that undaunted company.

The deep, that, like a cradled child,
In breathing slumber lay,
More warmly blush'd, more sweetly smiled,
As rose the kindling day:
Through ocean's mirror, dark and clear,
Reflected clouds and skies appear
In morning's rich array;
The land is lost, the waters glow,
'Tis heaven above, around, below.

Majestic o'er the sparkling tide
See the tall vessel sail,
With swelling wings in shadowy pride,
A swan before the gale;
Deep-laden merchants rode behind;
—But, fearful of the fickle wind,
Britannia's cheek grew pale,
When lessening through the flood of light,
Their leader vanish'd from her sight.

Oft had she hail'd its trophied prow,
Victorious from the war,
And banner'd masts that would not bow,
Though riven with many a scar;
Oft had her oaks their tribute brought,
To rib its flanks with thunder fraught;
But late her evil star
Had cursed it on its homeward way,
—'The spoiler shall become the prey.'

Thus warn'd, Britannia's anxious heart
  Throbb'd with prophetic woe,
When she beheld that ship depart,
  A fair ill-omen'd show!
So views the mother, through her tears,
The daughter of her hopes and fears,
  When hectic beauties glow
On the frail cheek, where sweetly bloom
The roses of an early tomb.

No fears the brave adventurers knew;
  Peril and death they spurn'd;
Like full-fledged eagles forth they flew;
  Jove's birds, that proudly burn'd,
In battle hurricanes to wield
His lightnings on the billowy field;
  And many a look they turn'd
O'er the blue waste of waves to spy
A Gallic ensign in the sky.

But not to crush the vaunting foe,
  In combat on the main,
Nor perish by a glorious blow,
  In mortal triumph slain,
Was their unutterable fate;
—That story would the muse relate,
  The song might rise in vain;
In ocean's deepest, darkest bed,
The secret slumbers with the dead.

On India's long-expecting strand
  Their sails were never furl'd;
Never on known or friendly land,
  By storms their keel was hurl'd;
Their native soil no more they trod;
They rest beneath no friendly sod;
  Throughout the living world,
This sole memorial of their lot
Remains,—they *were*, and they *are not!*

The spirit of the Cape pursued
  Their long and toilsome way;
At length, in ocean-solitude,
  He sprang upon his prey;

'Havoc!' the shipwreck-demon cried,
Loosed all his tempests on the tide,
Gave all his lightnings play;
The abyss recoil'd before the blast,
Firm stood the seamen till the last.

Like shooting stars athwart the gloom
The merchant-sails were sped;
Yet oft, before its midnight doom,
They mark'd the high mast-head
Of that devoted vessel, tost
By winds and floods, now seen, now lost;
While every gun-fire spread
A dimmer flash, a fainter roar;
—At length they saw, they heard no more.

There are to whom that ship was dear,
For love and kindred's sake;
When these the voice of Rumour hear,
Their inmost heart shall quake,
Shall doubt, and fear, and wish, and grieve,
Believe, and long to unbelieve,
But never cease to ache;
Still doom'd, in sad suspense, to bear
The Hope that keeps alive Despair.

MONTGOMERY.

PERCEPTIONS OF BEAUTY DEPEND ON ASSOCIATION.

IT is easy enough to understand how the sight of a picture or statue should affect us nearly in the same way as the sight of the original; nor is it much more difficult to conceive how the sight of a cottage should give us something of the same feeling as the appearance of a peasant's family; and the aspect of a town raise many of the same ideas as the appearance of a multitude of persons. We may take, therefore, an instance a little more complicated. Take, for example, the case of a common English landscape—green meadows, with fat cattle—canals or navigable rivers—well-fenced, well-cultivated fields—neat, clean, scattered cottages—humble antique church, with church-yard elms, and crossing hedge-rows—all

seen under bright skies, and in good weather. There is much beauty, as every one will acknowledge, in such a scene. But in what does the beauty consist? Not certainly in the mere mixture of colours and forms; for colours more pleasing, and lines more graceful, might be spread upon a board or painter's pallet, without engaging the eye to a second glance, or raising the least emotion in the mind; but in the picture of human happiness that is presented to our imaginations and affections,—in the unequivocal signs of comfort, and cheerful and peaceful enjoyment,—and of that secure and successful industry that ensures its continuance,—and of the piety by which it is exalted,—and of the simplicity by which it is contrasted with the guilt and the fever of a city life,—in the images of health, and temperance, and plenty, which it exhibits to every eye,—and in the glimpses which it affords to warmer imaginations of those primitive or fabulous times, when man was uncorrupted by luxury and ambition. It is man, and man alone, that we see in the beauties of the earth which he inhabits; it is the idea of enjoyment—of feelings that animate sentient beings—that calls forth all our emotions, and is the parent of all the beauty with which we proceed to invest the inanimate creation around us. Instead of this quiet and tame English landscape, let us now take a Welsh or a Highland scene, and see whether its beauties will admit of being explained on the same principle. Here we shall have lofty mountains, and rocky and lonely recesses—tufted woods hung over precipices—lakes intersected with castled promontories—ample solitudes of unploughed and untrodden valleys—nameless and gigantic ruins—and mountain-echoes repeating the scream of the eagle and the roar of the cataract. This, too, is beautiful; and, to those who can interpret the language it speaks, far more beautiful than the prosperous scene with which we have contrasted it. Yet, lonely as it is, it is to the recollection of man and human feelings that its beauty also is owing. The mere forms and colours that compose its visible appearance are no more capable of ex-

citing any emotion in the mind than the forms and colours of a Turkey carpet. It is sympathy with the present or the past, or the imaginary inhabitants of such a region, that alone gives it either interest or beauty; and the delight of those who behold it will always be found to be in exact proportion to the force of their imaginations, and the warmth of their social affections. The leading impressions here are those of romantic seclusion and primeval simplicity. Then, there is the sublime impression of the mighty Power which piled the massive cliffs upon each other, and rent the mountains asunder, and scattered their giant fragments at their base; and all the images connected with the monuments of ancient magnificence and extinguished hostility,—the feuds, and the combats, and the triumphs of its wild and primitive inhabitants, contrasted with the stillness and desolation of the scenes where they lie interred,—and the romantic ideas attached to their ancient traditions, and the peculiarities of their present life,—their wild and enthusiastic poetry,—their gloomy superstitions,—their attachment to their chiefs,—the dangers, and the hardships, and enjoyments of their lonely huntings and fishings,—their pastoral shielings on the mountains in summer,—and the tales and the sports that amuse the little groups that are frozen into their vast and trackless valleys in the winter. Add to all this, the traces of vast and obscure antiquity that are impressed on the language and the habits of the people, and on the cliffs, and caves, and gulfy torrents of the land; and the solemn and touching reflection, perpetually recurring, of the weakness and insignificance of perishable man, whose generations thus pass away into oblivion, with all their toils and ambition, while Nature holds on her unvarying course, and pours out her streams, and renews her forests, with undecaying activity, regardless of the fate of her proud and perishable sovereign.—We set all this down at random, from the vague and casual recollection of the impressions we have ourselves received from this sort of scenery; by no means as an exact transcript of the images and feelings which it must

excite in all beholders, but merely as a specimen of the manner in which it operates on the heart and imagination, and of the nature of that connexion which is established between our natural sympathies and the visible peculiarities of our mountain-landscape. JEFFREY.

ADAPTATION OF PLANTS TO THEIR RESPECTIVE PLACES OF GROWTH.

"Now, Philanthes, that we have reached the arbour, sit down, and inform me what part of the vegetable economy you have been studying lately."

"I have been tracing the adaptation of flowers, in respect to shape and colour, to the sites on which they grow; and, since you wish it, I shall enumerate a few of the most striking instances that I have remarked. *Papilionaceous* flowers are effectually defended from storms of wind and rain by the beautiful pavilions with which they are furnished. They are mounted on elastic stems, by means of which they are enabled to turn like weathercocks, and present their backs to the driving storms; and this provision is as wise as it is ornamental, for this class is generally found in places exposed to wind. In like manner the *fern*, which frequently crowns the summits of exposed situations, has its flowers arranged on the under-surface of the leaf, and turned towards the earth; whilst the white archangel, which grows on the sides of grassy banks, where every blade serves as a conduit for the water in showery weather, has its petals beautifully curved over the defenceless seeds. Corollas, you know, are designed to catch the rays of the sun; and in cases where they are divided into separate petals, they are often arranged so as to form an assemblage of polished mirrors directing the heat to one focus. It is remarkable, however, that, when the situation of the plant renders it necessary to dissipate rather than collect the heat, this arrangement is interrupted, and the petals are so disposed as to *preclude* any reflection from their polished surface on the *interior* of the flower. This last arrange-

ment is particularly conspicuous in the white lily. Notwithstanding the large size and dazzling whiteness of its corolla, the more it expands, the more it disperses the solar heat; and whilst on a midsummer's noon most of the flowery tribes droop their parched heads upon the ground, the lily rears her head, the empress of the garden, and contemplates, face to face, the meridian sun. Trumpet-shaped flowers, such as the *convolvulus*, convey as much heat as possible to the interior; and it is very remarkable, that this configuration is generally given to those which grow among high grass, or under the shade of trees. This wonderful adaptation is manifest too in the colours of flowers. White is well known to be peculiarly calculated for reflecting heat; and is it not for this reason that Nature has invested with this colour those flowers which blow in cold seasons and situations; the *snowdrop* for instance, the *lily of the valley*, *wood-sorrel*, &c.? Indeed almost all spring flowers are remarkable for their light colours. Those of the summer, on the contrary, are robed in tints of the most brilliant kind, fitted to absorb the sunbeams without reflecting them in any considerable degree."

"The same wonderful economy, Philanthes, I have remarked in the animal kingdom. The beneficial influence of the black substance which pervades the skin of the negro in preventing the scorching operation of the sun's rays is well ascertained. If you expose the back of the hand, either uncovered, or screened with thin white linen, to the direct influence of the sun, it will become irritated and inflamed; but if you defend it with a piece of black crape, this blistering influence will be entirely prevented. It is surely unnecessary to observe how forcibly such provisions indicate the wisdom and goodness of the Creator. You have spoken of the adaptation of the shape and colour of our common flowers to their respective situations, but you may extend the remark to every class of vegetables. The plants of different countries have separate and peculiar characters, according to the nature of the soil in which they grow,

and to the degree of solar heat to which they are exposed. Plants of the polar regions, for example, are generally low, with small close-set leaves, and flowers proportionally large; those of Europe are divested of showy leaves, and are in many instances furnished with catkins; the Asiatic countries are particularly rich in splendid flowers; whilst those of Africa have generally succulent leaves and variegated flowers. The extraordinary manner in which Nature has adapted *individual* plants too to their respective stations, is not less worthy of attention; and as I know you are fond of tracing such evidences of the hand of Him who is 'wonderful in counsel and excellent in working,' I shall mention a few striking instances."

"The cypress of Louisiana grows with its roots in water, and is principally found on the banks of the Mississippi. The circumference of the trunk is nearly thirty feet; and, in order to enable it to resist the floating masses of ice which, at the breaking up of the wintry season, come down in great quantities from the northern lakes, there are several large protuberances, acting as buttresses, evidently designed to protect the base. These protuberances are round and smooth; they have neither leaves nor branches, and therefore cannot be considered as shoots; they are in fact icebreakers. The branches of the *honeysuckle* shoot longitudinally, till they become unable to bear their own weight, and then strengthen themselves by changing into a spiral form. When they meet with other living branches of the same kind, they coalesce for mutual support, and one spiral turns to the right, and the other to the left; thus seeking, by an instinctive impulse, some object on which to climb, and increasing the probability of finding one by the diversity of their course; for if the auxiliary branch be dead, the other uniformly winds itself round from right to left. Plants which thus attach themselves to others are called *parasitic*, and are divided into two classes, the ornamental and injurious. The *caraguata*, a plant of the West Indies, is a striking instance of the latter. It clings round

the nearest tree, and, soon gaining the ascendency, covers the branches with a foreign verdure, robs them of nourishment, and at last destroys its supporter."

"The distinguishing characteristics of the last you have mentioned may, I think, be found among our own species. The despot who tyrannizes over the people from whom he has derived his power; the statesman who builds his greatness on the ruins of the country that nourished him; and the profligate youth who reduces a too-indulgent father to penury by his extravagance; all belong to the class of the *caraguata*."

"Have you ever turned your attention to aquatic plants, Philanthes? Their adaptation to their respective situations is very remarkable. The *lycopus Europæus*, or lesser bladder-snout, is in this respect one of the most curious of our native aquatic plants. The vesicles at the root consist of a thin, transparent, tough, horny, and elastic membrane, and are each of them furnished with an aperture closed by a lid, which opens only outwards. Before the flowers appear, the vesicles are filled with water; but when the stalks erect themselves, and approach the time of flowering, the water disappears, and, instead of it, air is secreted in them; by which means the plant rises to the surface, so that the flowers may unfold in open air. But when the time of flowering is over, and the seeds are arrived at perfection, the vesicles again fill with the former fluid, and the plant sinks to the bottom. Not unlike the *lycopus* is the *vallisneria*, which grows abundantly in the Rhine. Whilst the roots are fixed at the bottom of the river, the flowers float on the surface of the water, and are furnished with an elastic spiral stalk, which dilates and contracts as the water rises and falls. The leaves of land-vegetables perform the office of lungs, by exposing a large surface of vessels to the influence of air; aquatic ones also answer a similar purpose, like the gills of fish. As the materials which are necessary to life apparently abound much more in air than water, the sub-aquatic leaves of many plants are cut into fine divisions, to increase the surface; whilst those

above the water continue undivided. It is equally remarkable, that the plants of lofty mountains have their upper leaves much more serrated than the lower, because the air is rarer, and a larger surface of contact is necessarily required."

DETACHED SELECTIONS FROM VARIOUS POETS.

OH how unlike the complex works of man,
Heaven's easy, artless, unencumber'd plan!
No meretricious graces to beguile,
No clustering ornaments to clog the pile:
From ostentation, as from weakness, free,
It stands like the cerulean arch we see,
Majestic in its own simplicity.
Inscribed above the portal, from afar,
Conspicuous as the brightness of a star,
Legible only by the light they give,
Stand the soul-quickening words—*Believe and live.*

COWPER.

UPON thy mother's knee, a new-born child,
Weeping thou sat'st, whilst all around thee smiled;
So live, that, sinking into death's long sleep,
Calm thou may'st smile, whilst all around thee weep.

SIR W. JONES—*From the Persian of Hafiz.*

AVENGE, O Lord, thy slaughter'd saints, whose bones
Lie scatter'd on the Alpine mountains cold;
Even them who kept thy faith so pure of old,
When all our fathers worshipp'd stocks and stones,
Forget not: in thy book record their groans
Who were thy sheep, and in their ancient fold
Slain by the bloody Piedmontese, that roll'd
Mother with infant down the rocks. The moans
The vales redoubled to the hills, and they
To heaven. Their martyr'd blood and ashes sow
O'er all the Italian fields, where still doth sway
The triple tyrant; that from these may grow
A hundred-fold, who, having learn'd thy way,
Early may fly the Babylonian wo.

MILTON.

BREATHES there the man with soul so dead,
Who never to himself hath said,
  "This is my own, my native land?"
Whose heart hath ne'er within him burn'd
As home his footsteps he hath turn'd,
  From wandering on a foreign strand!
If such there breathe, go, mark him well;
For him no minstrel-raptures swell;
High though his titles, proud his name,
Boundless his wealth as wish can claim,
Despite those titles, power, and pelf,
The wretch, concentred all in self,
Living, shall forfeit fair renown,
And, doubly dying, shall go down
To the vile dust, from whence he sprung,
Unwept, unhonour'd, and unsung.
O Caledonia! stern and wild;
Meet nurse for a poetic child!
Land of brown heath and shaggy wood,
Land of the mountain and the flood,
Land of my sires! what mortal hand
Can e'er untie the filial band
That knits me to thy rugged strand!

SIR W. SCOTT.

YON cottager, who weaves at her own door,
Pillow and bobbins all her little store;
Content though mean, and cheerful if not gay,
Shuffling her threads about the live-long day,
Just earns a scanty pittance, and at night
Lies down secure, her heart and pocket light;
She, for her humble sphere by nature fit,
Has little understanding, and no wit;
Receives no praise; but though her lot be such,
(Toilsome and indigent), she renders much;
Just knows, and knows no more, her Bible true—
A truth the brilliant Frenchman never knew;
And in that charter reads, with sparkling eyes,
Her title to a treasure in the skies.
  O happy peasant! O unhappy bard!
His the mere tinsel, hers the rich reward;

He praised, perhaps, for ages yet to come,
She never heard of half a mile from home;
He lost in errors, his vain heart prefers,
She safe in the simplicity of hers. COWPER.

How still the morning of the hallowed day!
Mute is the voice of rural labour, hushed
The ploughboy's whistle, and the milkmaid's song.
The scythe lies glittering in the dewy wreath
Of tedded grass, mingled with fading flowers,
That yester-morn bloomed waving in the breeze.
Sounds the most faint attract the ear,—the hum
Of early bee, the trickling of the dew,
The distant bleating midway up the hill.
Calmness sits throned on yon unmoving cloud.
To him who wanders o'er the upland leas,
The blackbird's note comes mellower from the dale;
And sweeter from the sky the gladsome lark
Warbles with heaven-tuned song; the lulling brook
Murmurs more gently down the deep-worn glen;
While from yon lowly roof, whose curling smoke
O'ermounts the mist, is heard, at intervals,
The voice of psalms,—the simple song of praise.

GRAHAME.

THE smoothest seas will sometimes prove,
 To the confiding bark, untrue;
And if she trust the stars above,
 They can be treacherous too.

The umbrageous oak, in pomp outspread,
 Full oft, when storms the welkin rend,
Draws lightning down upon the head
 It promised to defend.

But thou art true, incarnate Lord!
 Who didst vouchsafe for man to die;
Thy smile is sure, thy plighted word
 No change can falsify!

WORDSWORTH.

DEAR to my spirit, Scotland, thou hast been,
Since infant years, in all thy glens of green;

Land of wild beauty and romantic shapes,
Of shelter'd valleys and of stormy capes;
Of the bright garden and the tangled brake,
Of the dark mountain and the sun-light lake;
Land of my birth and of my father's grave,
The eagle's home, the eyrie of the brave;
Land of affection, and of native worth;
Land where my bones shall mingle with the earth;
The foot of slave thy heather never stain'd,
Nor rocks that battlement thy sons profaned;
Land where Religion paves her heavenward road,
Land of the temple of the living God!
Yet dear to feeling, Scotland, as thou art,
Should thou that glorious temple e'er desert,
I would disclaim thee, seek the distant shore
Of Christian isle, and thence return no more.

JAMES GRAY—*Sabbath among the Mountains.*

WHO should lament for him within whose heart
Love had no place, nor natural charity?
The parlour spaniel, when she heard his step,
Rose slowly from the hearth, and stole aside
With creeping pace; she never raised her eyes
To woo kind words from him, nor laid her head
Upraised upon his knee, with fondling whine.
How could it be but thus? Arithmetic
Was the sole science he was ever taught.
The multiplication-table was his creed,
His paternoster, and his decalogue.
When yet he was a boy, and should have breathed
The open air and sunshine of the fields,
To give his blood its natural spring and play,
He in a close and dusky counting-house,
Smoke-dried, and seared, and shrivelled up his heart.
So from the way in which he was trained up
His feet departed not; he toiled and moiled,
Poor muckworm! through his threescore years and ten,
And when the earth shall now be shovelled on him,
If that which served him for a soul were still
Within its husk, 'twould still be dirt to dirt.

SOUTHEY

Then rose from sea to sky the wild farewell,
  Then shriek'd the timid, and stood still the brave;
Then some leap'd overboard with dreadful yell,
  As eager to anticipate their grave;
And the sea yawn'd around her like a hell,
  And down she suck'd with her the whirling wave,
Like one who grapples with his enemy,
And strives to strangle him before he die.

And first one universal shriek there rush'd,
  Louder than the loud ocean, like a crash
Of echoing thunder; and then all was hush'd,
  Save the wild wind, and the remorseless dash
Of billows; but at intervals there gush'd,
  Accompanied with a convulsive splash,
A solitary shriek, the bubbling cry
Of some strong swimmer in his agony. BYRON.

SECTION VIII.

INVENTIONS WHICH HAVE BEEN OF EXTENSIVE BENEFIT TO MANKIND.

1. *The Art of Printing.*—Of the powerful and permanent impulses to which mankind have been occasionally subjected, the first place is unquestionably due to the *Art of Printing.* Various cities have claimed the honour of this invention; but it is now generally admitted to be due to Haerlem, a town in Holland. It is attributed to Lawrence Koster, an alderman of this city, in 1440, whose house is yet standing in the market-place, opposite the church. Amusing himself one day in the neighbouring wood, with cutting the bark of trees into the letters that formed the initials of his name, he is said to have laid them on paper, and, falling asleep, when he awoke, observed, that from the dew their form was impressed on the paper. This accident induced him to make further experiment; he next cut his letters in

wood, and, dipping them in a glutinous liquid, impressed them on paper, which he found an improvement; and soon after, substituting leaden and pewter letters, erected a press in his house; thus laying the foundation of this noble art, which has thence gradually risen to its present excellence. The art, it is said, was stolen from him by his servant, John Faustus, who conveyed it to Mentz, and, from the novelty of the discovery, soon acquired the title of doctor and conjurer.

By the gradual improvement of this art, and its application to the diffusion of knowledge, a new era was formed in the annals of the human race, and in the history of science, religion, and morals. It has been the means of drawing the great mass of mankind from that profound abyss of ignorance in which they had, even in the most enlightened nations, been immersed, previous to the invention of this superexcellent art; and it has given a new character to the events which it is the business of the historian to record. In the flourishing ages of Greek and Roman literature, in consequence of the want of this art, none but persons of rank and property could acquire any knowledge of letters; and this must have ever continued to be the case, had not this invention, by reducing books to less than a hundredth part of their former price, facilitated the diffusion of knowledge among all ranks. We have it from good authority, that about A.D. 1215, the Countess of Anjou gave 200 sheep, five quarters of wheat, and the same quantity of rye, for a volume of sermons; and it is also upon record, that the value of manuscript copies of the Bible commonly was from 400 to 500 crowns,—a sum which, according to the relative value of money then and now, could not be less than as many pounds sterling at the present day. How trifling would be the literary attainments of the people of modern Europe if such a state of things still existed! The typographic art has contributed infinitely more to the improvement of the human mind, and the general civilization of the species, than all the speculations of ancient philosophy, or the valuable discoveries of later

times. To it we owe the Reformation from Popery—the rank we occupy as a nation—the sublime discoveries of science—the blessed diffusion of religion. Its inventors and improvers ought to have their names inserted in the registers of fame far above those of conquerors and heroes; and if ever the benefactors of mankind deserved to have statues erected to their honour, the inventors of the art of printing are certainly the men, for of all events which have ever happened among mankind, this invention constitutes, next to the establishment of Christianity, the most interesting and important.

2. *The Mariner's Compass.*—Another invention, which, in point of influence on society, is second only to the art of printing, is that of the *Mariner's Compass.* The art of navigation was partly known and practised in the early ages of antiquity by the Phœnicians, the Carthaginians, the Egyptians, the Romans, and other nations. But they had no guide to direct them in their voyages, except the sun in the daytime, and the stars by night. When the sky was overcast with clouds, they were thrown into alarms, having no clue to assist them in keeping or ascertaining their course. Their voyages, accordingly, consisted chiefly in creeping along the coast in sight of land; and hence the greater portion of the globe, and its inhabitants and productions, were to them altogether unknown. But the mariner's compass furnished mankind with a guide which has enabled them to undertake distant voyages, to traverse extensive oceans, and to carry on intercourse with the remotest parts of the earth.

The invention of the compass is usually ascribed to Flavio Gioia, of Amalfi, in Campania, about the year 1302; and the Italians are strenuous in supporting this claim. Others affirm, that Marcus Paulus, a Venetian, having made a journey to China, brought back the invention with him in 1260. The French also lay claim to the honour of this invention, from the circumstance that all nations distinguish the *north* point of the card by *a fleur de lis;* and, with equal reason, the English have

laid claim to the same honour, from the name *compass*, by which most nations have agreed to distinguish it. But, whoever were the inventors, or at whatever period this instrument was first constructed, it does not appear that it was used in navigation before the year 1420, or only a few years before the invention of printing. The loadstone in all ages was known to have the property of attracting iron; but its tendency to point towards the north and south seems to have been unnoticed till the beginning of the 12th century. About that time some curious persons seem to have amused themselves by making a loadstone suspended on a piece of cork swim in water, and to have remarked that, when left at liberty, one of the extremities pointed to the north. They had probably remarked also, that when iron is rubbed against loadstone, it acquires likewise the property of turning towards the north, and attracting needles and filings of iron. From one experiment to another they seem to have proceeded to lay a needle, touched with the magnet, on two small bits of straw floating on the water, and to observe that the needle invariably turned its point towards the north. The first use they seem to have made of these experiments was to impose upon simple people by the appearance of *magic*. For example, a hollow swan, or the figure of a mermaid, was made to swim in a basin of water, and to follow a knife with a bit of bread upon its point which had been previously rubbed on the loadstone. The experimenter convinced them of his power, by commanding, in his way, a needle laid on the surface of the water, to turn its point from the north to the east, or in any other direction. But some geniuses, of more sublime and reflective powers of mind, seizing upon these hints, at last applied them to the wants of navigation, and constructed an instrument, by the help of which the mariner can now direct his course to distant lands, through the vast and pathless ocean.

In consequence of the discovery of this instrument, *the* coasts of almost every land on the surface of the *globe* have been explored, and a regular intercourse be-

tween the most distant nations opened. The fate of the great human families indeed has been in a great measure decided by navigation. Is not the perpetual infancy of the Chinese owing chiefly to their ignorance of this art? On the contrary, if the Japanese and the Malays exhibit a character manly and enterprising, in comparison of that of other Asiatics, it was formed at the epoch when their squadrons traversed the great eastern ocean, which is at present filled with their colonies. What has kept the people of Africa stationary in ignorance but their inland situation, their destitution of gulfs and arms of the sea, their inaccessibility to navigation? What has given their ascendency to the European nations but their knowledge of navigation, and the aptitude of their countries for carrying it on? Since the compass and Columbus appeared, has not a new world seen our vessels land on its shores—has not a new Europe arisen—and has not the Atlantic ocean become what the Mediterranean was before, the great highway and thoroughfare of the civilized world?

But the march of civilization is far from being terminated; the wonders we have witnessed may still be surpassed. The Europeans have not confined themselves to the shores of that Atlantic ocean which, immense as it appeared to the Phœnician and the Greek navigators, is only an arm of the sea, compared to that great ocean which, under the names of the Indian, the Pacific, and the Eastern, extends from pole to pole. The American navigators have already crossed the whole of this aquatic hemisphere—already British colonists have begun to settle the innumerable islands which form, to the south-east of Asia, a fifth part of the world; and Australasia, the most delightful country of the globe, will probably, ere many ages pass away, have reached the highest pinnacle of civilization. Let another Cadmus carry thither that torch of religion and science which enlightens Europe! Let colonists, fraught with our learning, found a new Greece in Otaheite, or the Pelew Islands, then *those rising grounds, which now produce only aromatic herbs, will be covered with towns and palaces;*

bays now shaded by a forest of palms, will display a forest of masts; gold and marble will be extracted from the bowels of mountains as yet untouched by the miner; coral and pearls will be dragged from the bottom of the sea to adorn the new capitals; and one day, perhaps, Europe, Asia, Africa, and America, will find equals and rivals in countries, whose existence, at this moment, scarcely occupies their attention. Thus, in the history of the human race, the past, the present, and the future, are connected with the position of the great seas of the globe, and with the progress of navigation.

3. *Optical Instruments.—Telescope, Microscope.*— The invention of *optical instruments* is another of the valuable contributions which individual ingenuity has made to the general welfare. Not to mention *spectacles* (invented, it is said, by a Florentine, of the name of Salvino, in the beginning of the 14th century), one of the most beneficial discoveries ever made for a large portion of mankind, let us consider the *telescope* and *microscope*. The son of a spectacle-maker, of Middleburg in Holland, happening to amuse himself in his father's shop, by holding two glasses between his finger and his thumb, and varying their distance, perceived the weathercock of the church-spire opposite to him much larger than ordinary, and apparently much nearer, and turned upside down. This new wonder excited the amazement of the father; he adjusted two glasses on a board, rendering them moveable at pleasure; and thus formed the first rude imitation of a perspective-glass, by which distant objects are brought near to view. Galileo, a philosopher of Tuscany, hearing of the invention, set his mind to work in order to bring it to perfection. He fixed his glasses at the end of long organ-pipes, and constructed a telescope, which he soon directed to different parts of the surrounding heavens. He discovered four moons revolving round the planet Jupiter—spots on the surface of the sun, and the *rotation* of that globe around its axis—mountains and valleys in the moon—and numbers of fixed stars where scarcely one was visible to the naked eye. These dis-

coveries were made about the year 1610, a short time after the first invention of the telescope. Since that period this instrument has passed through various degrees of improvement, and, by means of it, celestial wonders have been explored in the distant spaces of the universe, which, in former times, were altogether concealed from mortal view.

The telescope has demonstrated the *literal* truth of those scriptural declarations which assert, that the stars are innumerable. Before the invention of this instrument not more than 1000 could be perceived in the clearest night. But this invention has unfolded to view not only thousands but millions of those luminaries dispersed in every direction. And the higher its magnifying powers, the more numerous those celestial orbs appear; leaving us no room to doubt that countless myriads more lie hid in the distant regions of creation, known only to Him "who counts the number of the stars, and calls them by their names." In short, the telescope may be considered as a vehicle for conveying us to the distant regions of space. By the aid of Dr Herschel's telescope, which magnifies 6000 times, we can view the magnificent system of the planet Saturn, as well as if we had performed a journey 800,000,000 miles in the direction of that globe, which, at the rate of 50 miles an hour, it would require a period of 1800 years to accomplish; by the same instrument we can contemplate the region of the fixed stars, their arrangement into systems, and their immense numbers, with the same amplitude of view as if we had actually taken a flight of 4000,000,000,000 miles into these unexplored regions, which could not be accomplished in several millions of years, though our motion was as rapid as that of a ball projected from a cannon. This instrument has, therefore, been justly described, when it has been called "a providential gift bestowed upon mankind, to serve as a temporary substitute for those powers of rapid flight, with which seraphim are endowed, and with which man himself may be in-

vested when he arrives at the summit of moral perfection."*

Not less wonderful are the discoveries of the *Microscope,* an instrument constructed on similar principles, for the purpose of examining minute objects. When and by whom this instrument was invented is not certainly known; though it is believed that Drebell, a Dutchman, who had one in 1621, was either the inventor or an early improver of it. By means of this optical contrivance we perceive a variety of wonders in almost every object in the animal, the vegetable, and the mineral kingdoms. We perceive, for instance, that every particle of matter, however minute, has a determinate form—that the very scales on the skin of a fish are all beautifully interwoven and variegated, like pieces of net-work, which no art can imitate—that the points of the prickles of vegetables, though magnified a thousand times, appear as sharp and well polished as to the naked eye—that every particle of the dust on a butterfly's wing is a beautiful and regularly organized feather—that every hair of our head is a hollow tube, with bulbs and roots, furnished with a variety of threads or filaments—and that the pores in our skin, through which the perspiration flows, are so numerous and minute, that a grain of sand would cover a hundred and twenty-five thousand of them. We perceive animated beings in certain liquids, so small that fifty thousand of them would not equal the size of a mite; and yet each of these creatures is furnished with a mouth, eyes, stomach, blood-vessels, and other organs for the performance of animal functions. In a stagnant pool, which is covered with a greenish scum during the summer months, every drop of the water is found to be a world teeming with thousands of inhabitants. The mouldy substance which usually adheres to damp bodies exhibits a forest of trees and plants, where the branches, leaves,

* Dick's "Christian Philosopher," from which interesting work great part of the present lesson is taken.

and fruit, can be plainly distinguished. In a word, by this admirable instrument we behold the same Almighty hand which rounded the spacious globe on which we live, and the huge masses of the planetary orbs, and directs them in their rapid motions through the sky; employed, at the same moment, in rounding and polishing ten thousand minute transparent globes in the eye of a fly; and boring and arranging veins and arteries, and forming and clasping joints and claws for the movements of a mite! We thus learn the admirable and astonishing effects of the wisdom of God, and that the Divine care and benevolence are as much displayed in the construction of the smallest insect, as in the elephant, or the whale, or in those ponderous globes which roll around us in the sky.

4. *The Steam-engine.*—We shall allude only to one additional invention—the Steam-engine—the richest boon which art has ever received from philosophy. This machine was invented by the Marquis of Worcester, very early in the reign of Charles II. for the purpose of raising water, and he seems to have first learned the expansive power of steam from the bursting of a cannon, which he had filled to the height of 3-4ths with water, closed up at the muzzle and touchhole, and exposed to the action of fire. But its great improver, and, indeed, as to all that is admirable in its structure, or vast in its utility, its inventor was James Watt of Birmingham, whose name it now bears. "It was by his inventions," says Mr Jeffrey, "that its action was regulated so as to make it capable of being applied to the finest and most delicate manufactures, and its power so increased as to set weight and solidity at defiance. By his admirable contrivances it has become a thing stupendous alike for its force and its flexibility; for the prodigious power which it can exert, and the ease and precision and ductility with which it can be varied, distributed, and applied. The trunk of an elephant, that can pick up a pin, or rend an oak, is as nothing to it. It can engrave a seal, and crush masses of obdurate metal before it; draw out, without breaking, a thread as fine as gossamer, and lift up a ship

of war like a bauble in the air. It can embroider muslin and forge anchors; cut steel into ribbands, and impel loaded vessels against the fury of the winds and waves."

"It would be difficult," adds the same distinguished writer, "to estimate the value of the benefits which this invention has conferred upon the country. It is our improved steam-engine that has fought the battles of Europe, and exalted and sustained, through the late tremendous contest, the political greatness of our land. It is the same great power which enables us to pay the interest of our debt, and to maintain the arduous struggle in which we are still engaged, with the skill and capital of countries less oppressed with taxation. But these are poor and narrow views of its importance. It has increased indefinitely the mass of human comforts and enjoyments, and rendered cheap and accessible all over the world the materials of wealth and prosperity. It has armed the feeble hand of man, in short, with a power to which no limits can be assigned; completed the dominion of mind over the most refractory qualities of matter; and laid a sure foundation for all those future miracles of mechanic power which are to aid and reward the labours of after generations."

ADDRESS TO A STEAM-BOAT.

FREIGHTED with passengers of every sort,
A motley throng, thou leav'st the busy port.
Thy long and ample deck, where scatter'd lie
Baskets, and cloaks, and shawls of scarlet dye;
Where dogs and children through the crowd are straying,
And on the bench apart, the fiddler playing,
While matron dames to tressel'd seats repair,—
Seems, on the gleamy waves, a floating fair.

Its dark form on the sky's pale azure cast,
Towers from this clust'ring group thy pillar'd mast.
The dense smoke issuing from its narrow vent
Is to the air in curly volumes sent,
Which, coiling and uncoiling on the wind,
Trails like a writhing serpent far behind.

Beneath, as each merged wheel its motion plies,
On either side the white-churn'd waters rise,
And, newly parted from the noisy fray,
Track with light ridgy foam the recent way,
Then far diverged, in many a welting line
Of lustre, on the distant surface shine.

Thou hold'st thy course in independent pride;
No leave ask'st thou of either wind or tide.
To whate'er point the breeze, inconstant, veer,
Still doth thy careless helmsman onward steer,
As if the stroke of some magician's wand
Had lent thee power the ocean to command.

Yet, ne'ertheless, whate'er we owe to thee,
Rover at will on river, lake, and sea,
Dearer to fancy, to the eye more fair,
Are the light skiffs, that, to the breezy air,
Unfurl their swelling sails of snowy hue
Upon the moving lap of ocean blue:
As the proud swan on summer lake displays,
With plumage bright'ning in the morning rays,
Her fair pavilion of erected wings,—
They change, and veer, and turn like living things.

In very truth, compared to these thou art
A daily lab'rer, a mechanic swart.
Beholding thee, the great of other days,
And modern men with all their alter'd ways,
Across my mind with hasty transit gleam,
Like fleeting shadows of a fev'rish dream:
Fitful I gaze, with adverse humours teased,
Half sad, half proud, half angry, and half pleased.

JOANNA BAILLIE.

THE ASSAULT.

'Tis the morn, but dim and dark.
Whither flies the silent lark?
Whither shrinks the clouded sun?
Is the day indeed begun?
Nature's eye is melancholy
O'er the city high and holy:
But without there is a din
Should arouse the saints within,
And revive the heroic ashes
Round which yellow Tiber dashes.

Oh, ye seven hills! awaken,
Ere your very base be shaken!

Hearken to the steady stamp!
Mars is in their every tramp!
Not a step is out of tune!
As the tides obey the moon,
On they march, though to self-slaughter,
Regular as rolling water,
Whose high waves o'ersweep the border
Of huge moles, but keep their order,
Breaking only rank by rank.
Hearken to the armour's clank!

Look upon the bristling wall,
Manned without an interval!
Round and round, and tier on tier,
Cannon's black mouth, shining spear,
Lit match, bell-mouthed musquetoon,
Gaping to be murderous soon.
All the warlike gear of old,
Mixed with what we now behold,
In this strife 'twixt old and new,
Gather like a locusts' crew.

Near—and nearer—nearer still,
As the earthquake saps the hill,
First with trembling hollow motion,
Like a scarce awakened ocean,
Then with stronger shock and louder
Till the rocks are crushed to powder,—
Onward sweep the varied nations!
Famine long hath dealt their rations.
To the wall, with Hate and Hunger,
Numerous as wolves, and stronger,
On they sweep. Oh! glorious city,
Must thou be a theme for pity!
Fight, like your first sire, each Roman!
Alaric was a gentle foeman!
Matched with Bourbon's black banditti!
Rouse thee, thou eternal City!
Rouse thee! Rather give the torch
With thy own hand to thy porch,
Than behold such hosts pollute
Your worst dwelling with their foot.

Now they reach thee in their anger:
Fire, and smoke, and hellish clangor
Are around thee, thou World's Wonder!
Death is in thy walls and under.
Now the meeting steel first clashes;
Downward then the ladder crashes,
With its iron load all gleaming,
Lying at its foot blaspheming!
Up again! for every warrior
Slain, another climbs the barrier.
Thicker grows the strife: thy ditches
Europe's mingling gore enriches.
Rome! although thy wall may perish,
Such manure thy fields will cherish,
Making gay the harvest-home;
But thy hearths, alas! oh, Rome!—
Yet be Rome amidst thine anguish,
Fight as thou wast wont to vanquish!—
Let each breathing heart dilated
Turn, as doth the lion baited!
Rome be crushed to one wide tomb,
But be still the Roman's Rome! BYRON.

HUMAN LIFE.

THE lark has sung his carol in the sky:
The bees have hummed their noon-tide lullaby;
Still in the vale the village-bells ring round,
Still in Llewellyn-hall the jests resound;
For now the caudle-cup is circling there,
Now, glad at heart, the gossips breathe their prayer,
And, crowding, stop the cradle to admire
The babe, the sleeping image of his sire.

A few short years—and then these sounds shall hail
The day again, and gladness fill the vale;
So soon the child a youth, the youth a man,
Eager to run the race his fathers ran.
Then the huge ox shall yield the broad sirloin;
The ale, now brewed, in floods of amber shine:
And, basking in the chimney's ample blaze,
Mid many a tale told of his boyish days,
The nurse shall cry, of all her ills beguiled,
'*'Twas on these knees he sate so oft and smiled.*'

And soon again shall music swell the breeze;
Soon, issuing forth, shall glitter through the trees
Vestures of nuptial white; and hymns be sung,
And violets scattered round; and old and young,
In every cottage-porch with garlands green,
Stand still to gaze, and, gazing, bless the scene;
While, her dark eyes declining, by his side
Moves in her virgin-veil the gentle bride.

And once, alas! nor in a distant hour,
Another voice shall come from yonder tower;
When in dim chambers long black weeds are seen,
And weeping's heard where only joy has been;
When by his children borne, and from his door
Slowly departing to return no more,
He rests in holy earth with them that went before.

And such is Human Life;—so gliding on,
It glimmers like a meteor, and is gone!
Yet is the tale, brief though it be, as strange,
As full methinks of wild and wondrous change,
As any that the wandering tribes require,
Stretched in the desert round their evening-fire;
As any sung of old in hall or bower
To minstrel-harps at midnight's witching-hour.

ROGERS.

STRUCTURE AND FUNCTIONS OF MAMMIFEROUS ANIMALS.

THE *teeth* of mammiferous animals are deserving of particular attention, because according to the numbers, form, and disposition of these, the various orders of quadrupeds have been arranged. In most animals of this class they are used, not only for the mastication of food, but as weapons of offence. They are inserted in two moveable bones, called jaws. The front-teeth, the office of which is to cut, are wedge-shaped, and so placed that, in action, their sharp edges are brought into contact, and thus divide the aliment. On each side of the front-teeth are the canine-teeth or tusks, which are larger, of a conical shape, and used for tearing the food. The teeth at the back of the jaw, between which the food is masticated, are called grinders. In animals which live on

vegetables, these are flattened at the top; but, in carnivorous animals, their upper surfaces are furnished with sharp and conically-pointed protuberances. Does not this evince the admirable contrivance of the Divine Constructor?

Nor is there less skill manifested in the structure of their *ears*. These openings are covered and defended by a cartilage, called the external ears, except in aquatic animals, which have merely orifices in the head through which sound is transmitted. The most defenceless animals possess the most delicate sense of hearing. The ears of wild animals are erect and somewhat funnel-shaped, capable of having their opening turned towards the quarter whence the sounds proceed; whereas those of tame and domesticated animals are, for the most part, long and pendulous. The final cause of all this is abundantly obvious.

The internal structure of mammalia is very admirable. The blood flows through the body from its reservoir, the heart, by a series of vessels called arteries, and returns by another series denominated veins. During the circulation, various fluids, called secretions, are separated from the blood, and are carried through little vessels to be lodged in appropriate reservoirs. These fluids are adapted to various purposes in the system. The *lungs*, which are placed within the thorax or chest, consist of two lobes. Into these the atmospheric air is inspired from the mouth; and in them the vital air and the matter of heat are separated; the former being necessary for the maintenance of life, and the latter for keeping up the fluidity of the blood. The mephitic air which remains after the decomposition is expired. The act of drawing in the atmospheric air, separating the vital air and matter of heat, and ejecting the mephitic air, is called *respiration*. In *digestion*, the juices fitted to nourish the body are separated from the less useful parts of the food. Reduced to a pulp, by means of the teeth and saliva, these pass through a canal to a larger reservoir, called the stomach, in which the aliment, penetrated and further dissolved

by new juices, undergoes a trituration or kind of grinding, and is separated into nutritive juices, which, on their union, are denominated *chyle*. These juices are then taken up by little vessels called lacteals, and converted into new blood and flesh. The alimentary canal again contracts on leaving the stomach, and is arranged in a great variety of folds called intestines, through which the residue of the food which is not converted into chyle passes.

The bodies of all mammiferous animals are supported by a frame of bones, called a *skeleton*. To these bones are attached the muscles or flesh, assemblages of fibres held together by membranes, and terminating in a kind of cords termed tendons. The muscles, when excited, produce motion in the different parts of the body; and it is their action which gives to all animals the power of changing their place, and of performing the various movements which are necessary to them. Sensation is supposed to arise from an irritation taking place on the ends of certain cords, called *nerves*, which are connected with the spinal-marrow and the brain. This is a part of the subject, however, on which science is able to shed but a feeble light. Assuredly the animal frame is "fearfully and wonderfully made!"*

Structure and Functions of Birds.—No division of the animal world furnishes more striking evidences of supreme wisdom, than that which includes the different

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* Mammalia have been divided into seven orders; into, 1, *Primates*, which have four front-teeth in each jaw, and one canine-tooth on each side in both jaws. 2. *Bruta*, which have no front-teeth. 3. *Ferae*, which have six front-teeth in each jaw, and one canine-tooth on each side in both jaws. 4. *Glires*, which have two long front-teeth in each jaw, and no canine-teeth. 5. *Pecora*, which have no front-teeth in the upper jaw, and have cloven hoofs on their feet. 6. *Belluæ*, which have obtuse front-teeth in each jaw, and undivided hoofs on their feet. And, 7, *Cete*, or whales, which have fins instead of feet, breathing-holes on the front and upper part of the skull, and flat horizontal tails. Apes and bats are instances of the *first* order; the rhinoceros and elephant of the *second*; dogs, cats, otters, bears, of the *third*; beavers, squirrels, hares, of the *fourth*; goats, sheep, oxen, and camels, of the *fifth*; horses, hogs, of the *sixth*; and whales and dolphins of the *seventh*.

feathered tribes. Their structure and habits of life are wonderfully adapted to the various functions they have to perform. Their feathers form an envelope for their bodies, which combines in a remarkable manner the apparently incompatible properties of lightness and warmth; and they are so disposed, one above the other, and from the forepart backward, that they present the least possible resistance to the air. For this purpose also their head is small, their bill wedge-shaped, their neck long and moveable in all directions, their body sharp on the underside and flat on the back, and their bones hollow and comparatively light. For the purpose of giving warmth to the body, a short soft down fills up all the vacant spaces between the shafts of the feathers.

But these indications of supreme wisdom are not confined to the general structure of birds. They may be seen in every part of that structure even the most minute. They may be seen in the admirable provision which is made for defending the feathers from the moisture of the atmosphere. Birds are each furnished on the rump with two glands, in which a quantity of unctuous matter is constantly secreting; this is pressed out by the bill for the lubrication of the feathers when it is necessary; and it is worthy of observation, that the supply of this fluid invariably accords with the necessities of the different species, those having most that reside constantly in the open air, and those that live principally under cover having a more scanty share.* They may be seen in the moveable membrane which defends the eye from injury when passing through hedges and thickets—a membrane which is semi-transparent, and which the bird can move at pleasure. They may be traced in the singular contrivance by which the bird is enabled to change the shape of the eye so as to see the insect that is within a few inches of it, and the bird of prey which is several miles distant. And they may be seen in the air-vessels which

* This *accounts for poultry*, when wet, making the ruffled and *uncomfortable appearance* that we observe.

are placed over the whole body, and which, by the constant supply of air which they furnish to the lungs, prevent respiration from being stopped or interrupted even in the swiftest flight.

The flight of birds is one of their most interesting peculiarities. The muscles by which the wings are moved are exceedingly large, and in some instances constitute not less than 1-6th of their whole weight. When a bird is on the ground, and intends to fly, he takes a leap, stretches his wings, and strikes them downward with great force. By this stroke the body is thrown into an oblique position. The stroke being completed, he moves up his wings; these being contracted, and having their edges turned upward, meet with little resistance from the air. When they are sufficiently elevated, he makes a second stroke downwards, and the reaction of the air again moves him forward. These successive strokes act as so many leaps taken in the air. When he wants to turn to the right or left, he strikes strongly with the opposite wing, and this impels him to the proper side. The tail acts like the rudder of a ship, except that it moves him upward or downward, instead of sideways. If he wants to rise he raises it; and if to fall he depresses it. In a horizontal position it keeps him steady. By spreading his wings he can continue to move horizontally for some time without striking them, because he has acquired a sufficient velocity, and his wings being parallel to the horizon, meet with but little resistance. When he begins to fall he can easily steer himself upward by his tail till the motion he had acquired is nearly spent; he must then renew it by two or three new strokes. On alighting he expands his wings and tail full against the air, that they may meet with all the resistance possible.

There is reason to believe, from numerous experiments, that the peculiar notes, or *song*, of the different species of birds are acquired, and are no more innate than language is in man. The attempt of a nestling bird to sing may be compared to the imperfect endeavour of a child to talk. Whilst the scholar is endeavouring to form his

song, when he is once sure of a passage, he commonly raises his tone; but when he is not thoroughly master of it he lowers his voice, as if he did not wish to be heard, and as if he could not yet satisfy himself. A common sparrow, taken from the nest when very young, and placed near a linnet or goldfinch, adopted a song which was a mixture of the notes of these two. Three nestling linnets were educated, one under a sky-lark, another under a wood-lark, and the third under a tit-lark, and, instead of the song peculiar to their own species, they adopted that of their respective instructors. A linnet, taken from the nest when about three days old, and brought up in the house of a gentleman at Kensington, having no other sounds to imitate, almost articulated the words, "pretty boy," and a few other sentences. Of British birds the nightingale is the most perfect in mellowness of tone, compass, plaintiveness, and execution.*

Structure and Functions of Amphibious Animals.— Under this title, from the circumstance of their living occasionally both on land and in water, Linnæus has arranged the oviparous quadrupeds, usually denominated *reptiles*, and the *serpents*. These have ever excited in mankind a great degree of abhorrence, originating in a dread of their supposed poisonous qualities, in the unpleasant sensation of touching perfectly cold animals, and in their often ugly and squalid forms. This abhorrence,

* Birds are divided into *land-birds* and *water-birds*. Land-birds are subdivided into, 1. *Rapacious birds*, which have their bill hooked, and an angular projection on each side of the upper mandible; they consist of vultures, eagles or hawks, and owls. 2. *Pies*, which have their bill sharp at the edge, compressed at the sides, and convex on the upper surface. To this order belong crows, humming-birds, parrots, woodpeckers, &c. 3. *Passerine birds*, which have a sharp-pointed bill; to which order belong finches, thrushes, larks, swallows, pigeons, &c. And, 4. *Gallinaceous birds*, which have the upper mandible considerably arched; pheasants, turkeys, peacocks, grouse, &c. belong to this order. Water-birds are subdivided into, 1. *Waders*, which have a roundish bill and fleshy tongue, and long legs; as herons, plovers, snipes, &c. which live chiefly among marshes and fens, and feed on worms; and, 2. *Swimmers*, which have the bill broad at the top, and covered with a membraneous skin. The tribes best known are the *ducks, petrels, pelicans*, and gulls, which live chiefly in the water, and feed on fish, worms, and aquatic plants.

however, is in most instances misplaced; and philosophers have found, that the form, the destination, and the importance of these animals, in the grand scale of nature, are so truly admirable as amply to repay the danger and trouble which attend the investigation of them.

By far the greater number live in retired, watery, and shady places, where they seem stationed to prevent the excessive multiplication of water animals and insects. When they can obtain it, they devour a great quantity of food at a time, but this is digested slowly, and they can sustain abstinence for a very long period. Their food is swallowed whole. They have a similar power of suspending respiration at pleasure, and, in consequence, are enabled to support their change of element without injury. All of them are extremely tenacious of life, and some of them will continue to move and exert animal functions, though deprived of their head or heart. Many of them have the power of reproducing any part of the body that may be destroyed; and most of them exhale loathsome odours, which arise probably either from the foulness of their abodes, or from the length of time that is occupied in digesting their food.

In cold and temperate climates nearly all the amphibia pass the winter in a torpid state. During this season they are often found perfectly stiff, in holes under ice, or in water; and they continue thus till they are revived by the returning warmth of the spring, when they become reanimated, change their skin, and appear abroad in a new dress. Some of them cast their skins frequently in the year; but tortoises and some other reptiles have an osseous covering which they do not change.

The sinuous motion of the serpent-tribe has been admired for its geometrical elegance in all ages. Their backbone consists of moveable articulations, and runs through the whole length of their body; and some of them can render their bodies perfectly stiff, so as to enable them to spring with greater force and velocity on their prey. The head is joined to the trunk without the intervention of a neck; and their jaws are so formed that

they can swallow bodies as thick and frequently thicker than themselves. The tongue is slender and cleft. But the most remarkable peculiarity is the tubular fangs on each side of the head of the *poisonous* serpents, by which they convey the venom from a bag at the base to the wound made by their bite.*

Structure and Functions of Fishes.—In consequence of the element in which fishes live being beyond human access, their history is less accurately known than that of any other class of animals; but, so far as their structure and functions have been ascertained, their external and internal conformation appear admirably adapted to their element and mode of life. Their shape, it cannot escape the most careless observer, is finely fitted to cleave their native deeps with the least possible resistance; and the horny scales which cover their bodies are evidently contrived for enabling them to resist the enormous pressure to which they are constantly subjected. The use of their fins and tail too is obvious; and the belly-fins cannot appear unnecessary, when it is recollected that their centre of gravity lies near the back, and that without some kind of feet they would float with their backs downward.

But some of their parts display contrivance which cannot be understood without closer examination. The *gills*, placed on each side of the neck, are the organs by which they breathe. In this operation they fill their mouth with water, which they throw backward with so much force as to lift open the great flap, and force the water out behind. And in the passage of this water, all, or at least the greatest part of the air contained in it is left behind, and carried into the body to perform its part in the animal economy. In proof of this fact, it has been ascertained that if the air be extracted from water into which fish are put, they immediately come to the surface, and

* Amphibia are divided into two orders, *reptiles* and *serpents*. The former have legs and flat naked ears without auricles: the principal tribes are tortoises, lizards, and frogs. The latter have neither feet nor ears, and their jaws are dilatable, and not articulated.

gasp as if for breath. This is the reason why, in winter, when a fish-pond is frozen over, it is necessary to break holes in the ice. Without this precaution the fish would speedily die. The *air-bladder*, which lies in the abdomen, along the course of the backbone, is an admirable contrivance for enabling them to increase or diminish their specific gravity, and thus sink or rise in the water. If they want to sink they compress this bladder by means of their abdominal muscles, so that the bulk of their body may be diminished, and its weight increased. If they want to rise, they relax the pressure of the muscles, the air-bladder again acquires its natural size, the body is rendered more bulky, and they ascend towards the surface. In some fish this bladder is single, in others double. Fish which are destitute of air-bladders have little facility of raising themselves in the water. The greater number of them consequently remain at the bottom, unless the form of their body enables them to strike the water downward with great force. This the skate, the thornback, and other species of *rays*, do with their large pectoral fins, which act upon the water in the same manner as the wings of birds do upon air. But, perhaps, the head of the fish is the most remarkable part of its conformation. "If we would dispose of a given quantity of matter," says Mr Brougham, "so that it shall have a certain length only, and a certain breadth at the thickest part, and move through the air or water with the smallest possible resistance, then we must form it into a figure, called the *solid of least resistance*, because of all the shapes that can be given to the body, its length and breadth remaining the same, this is the one which will make it move with the least resistance through the air, or water, or other fluid. A very difficult chain of mathematical reasoning leads to a knowledge of the curve, which, by revolving on its axis, makes a solid of this shape; and the curve resembles closely the face or head part of a fish. Nature, therefore, has fashioned these fishes so, that, according to mathematical principles, they

swim the most easily through the element they live and move in."*

Structure and Functions of Insects.—Nearly all insects (except spiders, and a few of the apterous tribe, which proceed nearly in a perfect state from the egg) undergo a *metamorphosis* at three different periods of their existence. The lives of these minute creatures, in their perfect state, is, in general, so short, that the parents have seldom an opportunity of seeing their living offspring; consequently they are neither provided with milk, like viviparous animals, nor impelled to sit upon their eggs like birds. In place of these, the all-directing Power has endowed them with the astonishing faculty of being able to discover what substance is fitted to afford the food proper for their young, though that food is, for the most part, totally different from that which the parent itself would eat. Some of them attach their eggs to the bark, or insert them into the leaves of trees and other vegetable substances; others form nests, which they store with insects or caterpillars, that will attain the exact state in which they may afford proper food for their young ones when they shall awaken into life; others convey their eggs into the body, and even into the internal viscera of larger animals; others drop them into the water, an element in which they could not themselves subsist. In short, the contrivances that insects adopt to ensure the subsistence of their offspring, are beyond enumeration. From the eggs of all insects proceed what are called *larvae*, grubs, or caterpillars. These consist of a long body, covered with a soft, tender skin, divided into segments or rings. In this larva state some insects re-

* The fishes are divided into six orders:—1. *Apodal*, with bony gills, and no ventral fins, as the eels. 2. *Jugular*, with bony gills, and ventral fins before the pectoral ones, as the cod and haddock. 3. *Thoracic*, with bony gills and ventral fins placed directly under the thorax, as the turbot, sole, perch, and mackerel. 4. *Abdominal*, with bony gills, and ventral fins placed behind the thorax, as the salmon, pike, herring, and carp. 5. *Branchiostegous*, with gills destitute of bony rays, as the pike-fish and the lump-fish. 6. Condropterygious, with cartilaginous gills, as the sturgeon, shark, skate, and lampron.

main for months, others for a year, and some even for two or three years; and they are, in general, exceedingly voracious, oftentimes devouring more than their own weight in the course of a day. As soon as their parts became perfected, they fix upon some convenient place for undergoing the change into what is called *pupa, aurelia,* or *chrysalis.* This is generally a place where they are safe from aggression, as in their transformation they have neither strength to resist, nor swiftness to avoid, the attack of an enemy. The Power which instructed the parents to deposit their eggs in a proper receptacle, directs the offspring to secure and appropriate situations for their future defenceless state. Some of them spin webs or cones, in which they enclose themselves; others wrap themselves up in leaves of vegetables; and many conceal themselves beneath the surface of the earth. Preparatory to the transformation, they cease to take any food; and when the change is at hand, many of them may be observed alternately extending and contracting their bodies, as if disengaging themselves from the caterpillar skin. In their chrysalid state they remain for some time apparently inanimate, though actually in possession of life; and as soon as they have acquired strength sufficient to break the bonds that surround them, they exert their power, and appear in their perfect state. For a little time they continue humid and weak; but as the humidity evaporates, their wings and shell become hardened, and they soon afterwards commit themselves with safety to their new element.

"Were a naturalist to announce," say Messrs Kirby and Spence, "the discovery of an animal which, for the first five years of its life, existed in the form of a serpent; which then penetrating into the earth, and weaving a shroud of the finest texture, contracted itself within this covering into a body resembling more than any thing else an Egyptian mummy; and which, lastly, after remaining in this state without food and motion for three years longer, should burst its silken cerements, and start

into day a winged bird, what a sensation would be excited by such strange intelligence! The metamorphoses of the insect world are equally strange and surprising. That butterfly, which amuses you with its aerial excursions, one while extracting nectar from the tube of the honeysuckle, and then, the very image of fickleness, flying to a rose, as if to contrast the hue of its wings with the colour of the flower, did not come into the world as you now behold it. At its first exclusion from the egg, and for some months afterwards, it was a worm-like caterpillar, crawling upon sixteen short legs, greedily devouring leaves with two jaws, and seeing by means of twelve eyes so minute as to be nearly imperceptible. You view it now furnished with wings capable of rapid and extensive flights; of its sixteen feet ten have disappeared, and the remaining six are wholly unlike those to which they have succeeded; its jaws have vanished, and are replaced by a curled-up proboscis suited only for sipping liquid sweets; the form of its head is entirely changed; two long horns project from its upper surface; and instead of twelve invisible eyes, you behold two, very large, and composed of at least 20,000 convex lenses, each supposed to be a distinct and effective eye. Dissect the animal, and compare its original internal conformation with its present, you will witness changes still more extraordinary. Nearly the whole body of the caterpillar was occupied by a capacious stomach; the butterfly has only an almost imperceptible thread-like viscus; the abdomen is now filled by two large packets of eggs: in the former, two spirally-convoluted tubes were filled with a silky gum; in the latter, both tubes and silk have almost totally vanished; and changes equally great have taken place in the economy and structure of the nerves and other organs. What a surprising transformation! Nor was this all. The change from one form to another was not direct; a state not less singular intervened. After casting its skin, even to its very jaws, several times, and attaining its full growth, the caterpillar attached itself to a leaf by a silken girth. Its body greatly con-

tracted; its skin once more split asunder, and disclosed an oviform mass, without exterior mouth, eyes, or limbs, and exhibiting no other symptom of life than a slight motion when touched. In this state of torpor the insect existed for many months, until at length the tomb burst; and out of a case not more than an inch long, and a quarter of an inch in diameter, proceeded the butterfly before you, which covers a surface of nearly four inches square."

The same authors have drawn a beautiful analogy between the different states of insects and those of the human soul. The butterfly, the representative of the soul, is prepared in the *larva* for its future state of glory; and if it be not destroyed by the ichneumons and other enemies to which it is exposed,—symbolical of the sins which destroy the spiritual life of the soul,—it will come to its state of repose in the *aurelia,* which is its Hades; and at length, when it assumes the *imago,* which is its heavenly existence, break forth with new power and beauty to its final glory.

The most remarkable parts in insects are their *feet* and *eyes*. The structure of the former is truly admirable. Those insects that live altogether in water have them long, flat, and somewhat hairy at the edges, well adapted to aid their motions in that element. Such as have occasion to burrow into the earth, have them broad, sharp-edged, and serrated. Some have them furnished with sharp, hooked claws, and skinny palms, by which, from the pressure of the atmosphere upon them, they are enabled to walk on glass and other smooth surfaces even with their backs downwards. Others have somewhat like sponges, which answer the same end; and the spider has each foot armed with a kind of comb, probably for the purpose of separating the six threads that issue from so many orifices of its body, and preventing them from tangling. In insects which have occasionally to pass over spaces by leaping, the thighs of the hind-legs are peculiarly large and thick.

The *eyes* of insects are among the most curious pro-

ductions of Nature. On the head of a fly are two large protuberances, one on each side; the whole surface of these protuberances is covered with a multitude of small hemispheres, placed with the utmost regularity in rows, crossing each other in a kind of lattice-work. These little hemispheres have each of them a transparent convex lens in the middle, each of which has a distinct branch of the optic nerve ministering to it, so that the different lenses are just so many distinct eyes. Mr Leeuwenhoek counted 8000 in the two eyes of a *common fly*. In one of the eyes of a *dragon fly* there have been reckoned 13,500 of these lenses, and, consequently, in both eyes 27,000, every one of which is capable of forming a distinct image of any object, in the same manner as a common convex lens; so that there are 27,000 images formed on the retina of this little animal. Mr Leeuwenhoek, having prepared the eye of a fly for the purpose, placed his microscope so as to have a proper focal distance between it and the lens of his instrument, and then looked through both in the manner of a telescope at the steeple of a church, which was 299 feet high and 750 feet distant. He saw plainly through every little lens the whole steeple inverted, though not larger than the point of a fine needle. Directing it next to a neighbouring house, he saw not only the front of the house, but also the doors and windows, and could discern distinctly whether the windows were open or shut. Such an exquisite piece of Divine mechanism utterly transcends all human comprehension.*

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* Linnæus has divided insects into seven orders,—Coleoptera, Hemiptera, Lepidoptera, Neuroptera, Hymenoptera, Diptera, and Aptera. The two first have their wings defended by a pair of hard crustaceous cases called *elytra;* the three subsequent orders have four membranaceous wings without elytra; the insects of the sixth order have but two wings, and under each of these, at its base, a poise or balancer, which seems to be of the same use to insects as a long pole, loaded at each end with lead, is to a rope-dancer; the seventh class includes all insects that are destitute of wings, as spiders, &c.

LANDING OF THE ENGLISH IN PORTUGAL.

It was a dread, yet spirit-stirring sight!
The billows foam'd beneath a thousand oars;
Fast as they land the red-cross ranks unite,
Legions on legions brightening all the shores.
Then banners rise, and cannon-signal roars,
Then peals the warlike thunder of the drum,
Thrills the loud fife, the trumpet-flourish pours,
And patriot hopes awake, and doubts are dumb,
For, bold in Freedom's cause, the bands of Ocean come!

A various host they came—whose ranks display
Each mode in which the warrior meets the fight;
The deep battalion locks its firm array,
And meditates his aim the marksman light;
Far glance the lines of sabres flashing bright,
Where mounted squadrons shake the echoing mead—
Lacks not artillery breathing flame and night,
Nor the fleet ordnance whirl'd by rapid steed,
That rivals lightning's flash, in ruin and in speed.

A various host—from kindred realms they came,
Brethren in arms, but rivals in renown—
For yon fair bands shall merry England claim,
And with their deeds of valour deck her crown.
Her's their bold port, and her's their martial frown,
And her's their scorn of death in Freedom's cause,
Their eyes of azure, and their locks of brown,
And the blunt speech that bursts without a pause,
And freeborn thoughts, which league the soldier with the laws.

And, oh! loved warriors of the Minstrel's land!
Yonder your bonnets nod, your tartans wave!
The rugged form may mark the mountain band,
And harsher features, and a mien more grave;
But ne'er in battle-field throbb'd heart so brave
As that which beats beneath the Scottish plaid;
And when the pibroch bids the battle rave,
And level for the charge your arms are laid,
Where lives the desperate foe, that for such onset staid!

Hark! from yon stately ranks what laughter rings,
Mingling wild mirth with war's stern minstrelsy,

His jest while each blithe comrade round him flings,
And moves to death with military glee:
Boast, Erin, boast them! tameless, frank, and free,
In kindness warm, and fierce in danger known,
Rough Nature's children, humorous as she;
And HE, yon Chieftain—strike the proudest tone
Of thy bold harp, green Isle!—the Hero is thine own.

SIR WALTER SCOTT.

THE COVENANTERS.

THEY stood prepared to die, a people doomed
To death;—old men, and youths, and simple maids,
With them each day was holy; but that morn,
On which the angel said, *See where the Lord*
Was laid, joyous arose; to die that day
Was bliss. Long ere the dawn, by devious ways
O'er hills, through woods, o'er dreary wastes, they sought
The upland moors, where rivers, there but brooks,
Dispart to different seas. Fast by such brooks
A little glen is sometimes scooped, a plat
With green sward gay, and flowers that strangers seem,
Amid the heathery wild, that all around
Fatigues the eye: in solitudes like these
Thy persecuted children, SCOTIA, foiled
A tyrant's and a bigot's bloody laws:
There, leaning on his spear (one of the array,
Whose gleam, in former days, had scathed the rose
On England's banner, and had powerless struck
The infatuate monarch and his wavering host)
The lyart veteran heard the word of God
By Cameron thundered, or by Renwick poured
In gentle stream; then rose the song, the loud
Acclaim of praise; the wheeling plover ceased
Her plaint; the solitary place was glad:
And on the distant cairns the watcher's ear*
Caught doubtfully at times the breeze-borne note.
But years more gloomy followed; and no more
The assembled people dared, in face of day,

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* Sentinels were placed on the surrounding hills to give warning of the approach of the military.

To worship God, or even at the dead
Of night, save when the wintry storm raved fierce,
And thunder-peals compelled the men of blood
To couch within their dens; then dauntlessly
The scattered few would meet, in some deep dell
By rocks o'ercanopied, to hear the voice,
Their faithful pastor's voice: he by the gleam
Of sheeted lightning oped the sacred book,
And words of comfort spake: over their souls
His accents soothing came,—as to her young
The heathfowl's plumes, when, at the close of eve,
She gathers in, mournful, her brood dispersed
By murderous sport, and o'er the remnant spreads
Fondly her wings; close nestling 'neath her breast,
They, cherished, cower amid the purple blooms.

GRAHAME.

THE BRITISH CONSTITUTION.

IN England the supreme government,—that is the power of making and enforcing laws,—is divided into two branches; the one *legislative,* consisting of king, lords, and commons; the other *executive,* consisting of the king alone.

The executive or regal office is hereditary on certain conditions; but the right of inheritance may be changed or limited by act of parliament. The principal duty of the king is to govern the people according to the laws; "but although the king," says Lord Bacon, "is the fountain of justice, and is intrusted with the whole executive power of the law, yet he hath no power to change or alter the laws which have been received and established in these kingdoms, and are the birthright of every subject; for it is by those very laws that he is to govern." The king owns no superior but God and the laws. It is a maxim of the constitution, that the king in his political capacity can do *no wrong,* because he acts only by officers responsible to the law. The king *never dies;* that is, the executive authority never ceases to exist. The king is head of the church, but he cannot alter the established

religion. He is also generalissimo of all the forces; but he cannot raise an army without the consent of parliament, nor can he maintain it without that consent being renewed from year to year. He has the power of coining money, but he cannot alter the standard. He is the sole representative of his people with foreign states, having the power of sending ambassadors, concluding treaties of alliance, and making peace or war. The king has the power of summoning, proroguing, or dissolving the parliament; but he is bound to summon a new parliament at least every seven years. He is also bound to administer justice in the established course in his courts of law, not as a free gift, but as the due of his people. The king is the fountain of mercy; he alone can pardon all public offences, either absolutely or conditionally; and of honour, as the constitution has intrusted him with the sole power of conferring titles, dignities, and honours. He is also intrusted with the immense patronage of the church, the army, the navy, the excise, and the colonies. As first magistrate of a great and free people, he is invested with many other splendid marks of regal dignity and pre-eminence, all intended by the constitution to be employed for the good of the people.

The *legislative* authority is vested in a parliament, consisting of the king, the lords spiritual and temporal, and the commons. The House of Lords consists of the two archbishops and twenty-four bishops, and of all the peers of the realm who are entitled to a seat either by inheritance, creation, or election. The House of Commons consists of six hundred and fifty-eight persons, who are returned by the counties, cities, and boroughs, possessing the right of election. Of these, five hundred and thirteen are returned by England, a hundred by Ireland, and forty-five by Scotland. Though delegated by particular places, they are bound as members of parliament to act for the general good of the country. Their principal duties are to check and reform abuses of the administration—to redress public and private grievances—to watch over the public expenditure—to enforce by their power

of inquiry and impeachment a pure administration of justice in all departments—to assist in framing wise laws—and, finally, to preserve and promote, by every constitutional means, the freedom and prosperity of the great body of the people. The powers and privileges of this part of the legislature are commensurate to its great importance in the government. The commons possess the sinews of war; they are the keepers of the public purse; all grants, subsidies, and taxes, must originate with them; for it is a constitutional maxim, that taxation and representation go hand in hand; and that the people only have a right to tax themselves. By the power of withholding supplies, they have a strong control over the executive; and by the constitution they enjoy all the privileges necessary to their dignity and independence, and the unbiassed discharge of their high functions. Though new laws may be proposed by any member of either house, the consent of all the three constituent parts of the legislature is necessary to make them binding on the subject; and though any part of the legislature may, by withholding its consent, prevent the enactment of a law, it requires the agreement of all the three to repeal an existing statute.

"Thus," as observed by Blackstone, "the true excellence of the British government consists in all its parts forming a mutual check upon each other. The legislature cannot abridge the executive power of any rights which it now has by law, without its own consent. The people are a check upon the nobility, and the nobility are a check upon the people, by the mutual privilege of rejecting what the other has resolved; while the king is a check upon both; which preserves the executive power from encroachment. And this very executive power is again checked, and kept within due bounds, by the two houses, through the privilege they have of inquiring into, impeaching, and punishing, the conduct, not indeed of the king, (which would destroy his constitutional independence), but which is more beneficial to the public, of his evil and pernicious counsellors."

The same laws that secure to the king his crown and prerogative, secure to the meanest subject those rights which are emphatically styled the birthright of Britons. These are principally, the right of personal *security*, of personal *liberty*, and of private *property*. They are asserted, first, by the Great Charter obtained, sword in hand, from King John, and afterwards confirmed in parliament by Henry III. Next, by a multitude of corroborating statutes, and, after a long interval, by the Petition of Right, the Habeas Corpus Act, and the Bill of Rights. And, lastly, these liberties were again asserted in the same act (the Act of Settlement) that limits the crown to the present royal family. The Great Charter, declaratory of these rights, states,—"That no freeman shall be taken or imprisoned but by the lawful judgment of his equals, or the law of the land;" and the Petition of Rights,—"That no person shall be imprisoned or detained without cause shewn, to which he may answer according to law." JOHNSTONE'S *Collection*.

CIRCULATION OF THE BLOOD.

THE manner in which the blood-vessels are disposed in the human body, bears some resemblance to the arrangement of the pipes by which a great city is supplied with water. London is supplied by means of an engine contrived for the purpose of distributing the water of the New River through the city. Large trunks are carried from this machine in different directions; smaller pipes branch out from these trunks into streets, lanes, and alleys; still smaller ones issue from them, and convey the water into private houses. So far the resemblance is complete. These water-pipes represent the *arteries* which carry the blood from the heart to the extremities of the body; but in the human body another contrivance was necessary. The citizens of London may use the water or waste it as they please; but the precious fluid conveyed by the arteries to the ends of the fingers must

be returned to the heart; for on its unceasing circulation our health depends.

In order to effect this purpose, another set of pipes is prepared, called *veins*, which, joining the extremities of the arteries, receive the blood from them, and carry it back again to the heart. The veins present the same general appearance as the arteries; but as it is the office of the arteries to distribute the blood, so it is that of the veins to collect it. Through them it flows back to the heart in a manner just the reverse of that in which it sets out; the minute veins unite in larger branches, the larger branches unite in still larger trunks, till the collected blood is at length poured into the heart through one opening.

The engine that works this curious machinery is the *heart*. The heart is composed of four cavities. Like other muscles it has the power of contracting; and when it contracts, the sides of its cavities are squeezed together, so as to force out any fluid the heart may at that moment contain. This purpose being effected, the fibres relax, the heart once more becomes hollow, and, as it dilates, the blood pours into the cavities from the large vein which brings it back to the heart. The next contraction forces the blood into the arteries, the quantity thus impelled being always equal to that which has just been received; and thus this wonderful organ goes on, alternately contracting and dilating itself, *four thousand* times in an hour. Month after month, year after year, it goes on without weariness or interruption, conveying renewed strength to every part of the body. The two largest cavities of the heart, which send out the blood to the arteries, are called *ventricles*; the two smallest, which receive it from the veins, *auricles*. All the arteries are furnished with valves that play easily forward, but admit not the blood to return to the heart.

In all this there is abundant evidence of wise contrivance. The blood, in going out from the heart, is continually passing from wide tubes into those which are

narrower; in coming back, it passes from narrow vessels into wider: consequently the blood presses the sides of the arteries with greater force than it acts against the coats of the veins. To prevent any danger from this difference of pressure, the arteries are formed of much tougher and stronger materials than the veins. This is one difference between the two; there is another still more strikingly illustrative of the care of the Great Artificer. As a wound in the arteries, through which the blood passes with such force from the heart, would be more dangerous than a wound in the veins, the arteries are defended, not only by their stronger texture, but by their more sheltered situation. They are deeply buried among the muscles, or they creep along grooves made for them in the bones. The under side of the ribs is sloped and furrowed, to allow these important tubes to pass along in safety; and in the fingers, which are liable to so many casualties, the bones are hollowed out in the inside like a scoop. Along this channel the artery runs in such security, that you might cut your finger across to the bone without doing it any injury. MARIA HACK.

MISCELLANEOUS SELECTIONS.

LEAVES have their time to fall,
And flowers to wither at the North-wind's breath,
And stars to set—but all,
Thou hast *all* seasons for thine own, O, Death!

Day is for mortal care,
Eve for glad meetings round the joyous hearth,
Night for the dreams of sleep, the voice of prayer;
But all for thee, thou Mightiest of the Earth!

We know when moons shall wane,
When summer-birds from far shall cross the sea,
When autumn's hue shall tinge the golden grain;
But who shall teach us when to look for thee?

Is it when spring's first gale
Comes forth to whisper where the violets lie?
Is it when roses in our paths grow pale?
They have one season—all are ours to die!

Thou art where billows foam;
Thou art where music melts upon the air;
Thou art around us in our peaceful home;
And the world calls us forth—and thou art there;

Thou art where friend meets friend,
Beneath the shadow of the elm to rest;
Thou art where foe meets foe, and trumpets rend
The skies, and swords beat down the princely crest!

MRS HEMANS.

I LOVE, and have some cause to love, the Earth—
She is my Maker's creature, therefore good;
She is my mother, for she gave me birth;
She is my tender nurse, she gives me food;—
But what's a creature, Lord, compared with Thee?
Or what's my mother or my nurse to me?

I love the Air, her dainty sweets refresh
My drooping soul, and to new sweets invite me.
Her shrill-mouthed choir sustain me with their flesh,
And with their Polyphonian notes delight me.
But what's the Air, or all the sweets that she
Can bless my soul withal, compared with Thee?

I love the Sea; she is my fellow-creature,
My careful purveyor, she provides me store;
She walls me round, she makes my diet greater,
She wafts my treasure from a foreign shore.
But, Lord of Oceans, when compared with Thee,
What is the Ocean or her wealth to me?

To Heaven's high city I direct my journey,
Whose spangled suburbs entertain mine eye,
Mine eye, by contemplation's great attorney,
Transcends the crystal pavement of the sky.
But what is Heaven, great God, compared with Thee?
Without Thy presence, Heaven's no Heaven to me.

QUARLES.

THOU art sounding on, thou mighty sea,
For ever and the same!
The ancient rocks yet ring to thee,
Whose thunders nought can tame.

The Dorian flute, that sigh'd of yore
  Along thy wave, is still;
The harp of Judah peals no more
  On Zion's awful hill.

And Memnon's, too, hath lost the chord
  That breathed the mystic tone;
And the songs at Rome's high triumphs pour'd,
  Are with her eagles flown.

And mute the Moorish horn, that rang
  O'er stream and mountain free,
And the hymn the learn'd Crusaders sang
  Hath died in Galilee.

But thou art swelling on, thou deep,
  Through many an olden clime,
Thy billowy anthem ne'er to sleep
  Until the close of Time!

MRS HEMANS.

CHILD, amidst the flowers at play,
While the red light fades away;
Mother, with thine earnest eye,
Ever following silently;
Father, by the breeze of eve,
Called thy harvest work to leave:
Pray! ere yet the dark hours be,
Lift the heart and bend the knee.

Traveller, in the stranger's land,
Far from thine own household band;
Mourner, haunted by the tone
Of a voice from this world gone;
Captive, in whose narrow cell
Sunshine hath not leave to dwell;
Sailor, on the darkening sea—
Lift the heart and bend the knee.

Warrior, that from battle won,
Breathest now at set of sun;
Woman, o'er the lowly slain,
Weeping on his burial plain;
Ye that triumph, ye that sigh,
Kindred by one holy tie;

Heaven's first star alike ye see—
Lift the heart and bend the knee.

MRS HEMANS.

——— METHINKS if ye would know
How visitations of calamity
Affect the pious soul, 'tis shewn ye there!
Look yonder at that cloud which, through the sky,
Sailing alone, doth cross in her career
The rolling moon!—I watch'd it as it came,
And deem'd the deep opaque would blot her beams;
But, melting like a wreath of snow, it hangs
In folds of wavy silver round, and clothes
The orb with richer beauties than her own,
Then passing, leaves her in her light serene!

SOUTHEY.

STAND the Omnipotent decree,
Jehovah's will be done!
Nature's end we wait to see,
And hear her final groan:
Let this earth dissolve and blend
In death the wicked and the just;
Let those ponderous orbs descend,
And grind us into dust!

Rests secure the righteous man
At his Redeemer's beck,
Sure to emerge and rise again,
And mount above the wreck:
Lo! the heavenly spirit towers,
Like flames o'er Nature's funeral pyre;
Triumphs in immortal powers,
And claps his wings of fire!

Nothing hath the just to lose,
By worlds on worlds destroy'd;
Far beneath his feet he views,
With smiles, the flaming void;
Sees this universe renew'd,
The grand millennial reign begun;
Shouts with all the sons of God
Around the Eternal throne!

C. WESLEY.

VARIETY OF NATURE.

In every region on the surface of the globe, an endless multiplicity of objects present themselves to the view of the beholder. Nothing can exceed the variety of the *vegetable kingdom*, which pervades almost every portion of the dry land, and of the bed of the ocean. The immense collections of natural history which are to be seen in the Museum at Paris shew, that botanists are already acquainted with nearly fifty-six thousand different species of plants; and yet it is probable that these form but a very small portion of what actually exists: for by far the greater part of the vegetable world still remains to be surveyed by the scientific botanist. It has been conjectured, that there is not a square league of earth but what presents some one plant peculiar to itself; so that the number of species of vegetables probably amounts to as many millions as there are square leagues on the surface of the earth. Now, every one of these species of plants differs from another in its size, structure, form, flowers, leaves, fruits, mode of propagation, colour, medicinal virtues, nutritious qualities, internal vessels, and the odours it exhales. They are of all sizes, from the microscopic mushroom to the cedar of Lebanon, and from the slender willow to the Banian tree, under whose shade 7000 persons may find ample room to repose. Every one wears its peculiar livery. Some grow upright, others creep along in a serpentine form; some flourish for ages, others wither and decay in a few months; some spring up in moist, others in dry soils; some turn towards the sun, others shrink and contract when we approach them. Not only are the different species of plants and flowers distinguished from each other by their different forms, but even the different individuals of the same species. Of all the hundred thousand millions of plants, trees, herbs, and flowers, with which our globe is variegated, there are not, perhaps, two individuals precisely alike, in every point of view in which they may be contemplated; nay, there is not, perhaps, a single leaf in the forest,

when minutely examined, that will not be found to differ, in certain aspects, from its fellows!

When we direct our attention to the tribes of *animated nature*, we behold a scene no less variegated. Above fifty thousand species of animals have been detected and described by naturalists; and, as the greater part of the globe has never yet been thoroughly explored, many thousand additional species may exist in the depths of the ocean, and in the unexplored regions of the land. All these species differ from one another in colour, size, and shape; in the structure of their bodies, in the number of their sensitive organs, limbs, feet, joints, claws, wings, and fins; in their dispositions, faculties, movements, and modes of subsistence. They are of all sizes, from the mite and the gnat, up to the elephant and the whale; and from the mite downwards to those invisible animalculæ, a hundred thousand of which would not equal a grain of sand. Some fly through the atmosphere, some glide through the waters, others traverse the solid land; some walk on two, some on four, some on twenty, and some on a hundred feet; some have eyes furnished with two, some with eight, some with a hundred, and some with twenty thousand distinct transparent globes, for the purposes of vision.

Could we descend into the subterraneous apartments of the globe, we should, doubtless, behold there also a variegated scene of wonders. In those regions which lie within the sphere of human inspection, we perceive a variety analogous to that already noticed. We find substances of various kinds formed into strata of different depths—earths, sand, gravel, marl, clay, sand-stone, free-stone, marble, limestone, fossils, coals, peat, and similar materials. In these strata are found metals and minerals of various descriptions—salt, nitrate of potash, ammonia, sulphur, bitumen, platina, gold, silver, mercury, iron, lead, tin, copper, zinc, nickel, manganese, cobalt, antimony, the diamond, rubies, sapphires, jaspers, emeralds, and a countless variety of other substances of incalculable benefit to mankind.

If we turn our eyes upward to the regions of the atmosphere, we may also behold a spectacle of variegated magnificence. Sometimes the sky is covered with sable clouds, or obscured with mists; at other times it is tinged with a variety of hues, by the rays of the rising or the setting sun. Sometimes it presents a pure azure, at other times it is diversified with strata of dappled clouds. At one time we behold the rainbow rearing its majestic arch, adorned with all the colours of light; at another, the Aurora Borealis illuminating the sky with its fantastic coruscations. At one time we behold the fiery meteor sweeping through the air; at another, we perceive the forked lightning darting from the clouds, and hear the thunders rolling through the sky. Sometimes the vault of heaven appears like a boundless desert, and at other times adorned with an innumerable host of stars, and with the moon "walking in brightness." In short, whether we direct our view to the vegetable or the animal tribes, to the atmosphere, the ocean, the mountains, the plains, or the subterranean recesses of the globe, we behold a scene of beauty, order, and *variety*, which astonishes and enraptures the contemplative mind; and, if every other world, which floats in the immensity of space, be diversified with a similar variety of existences, altogether different from ours (as we have reason to believe, from the variety we already perceive), the human mind is lost and confounded, when it attempts to form an idea of those endlessly-diversified plans, conceptions, and views, which must have existed during an eternity past in the Divine Mind. DICK.

SIMPLICITY OF NATURE.

"THE forms and appearances," says Sir Humphrey Davy, "of the beings and substances of the external world, are almost infinitely various, and they are in a state of continued alteration. Even the earth itself, throughout its whole surface, undergoes modifications. *Acted on by moisture* and air, it affords the food of plants;

an immense number of vegetable productions arise from apparently the same materials; these become the substance of animals; one species of animal matter is converted into another; the most perfect and beautiful of the forms of organized life ultimately decay, and are resolved into inorganic aggregates; and the same elementary substances, differently arranged, are contained in the inert soil; or bloom, and emit fragrance in the flower; or become, in animals, the active organs of mind and intelligence." Those simple elements into which all bodies are resolvable are few in number, and, besides the *metals*, consist chiefly of the following; caloric, light, oxygen, nitrogen, carbon, and hydrogen.

Oxygen is a very subtile, and elastic substance; generally diffused throughout nature, although never found unless in combination with other substances. There is scarcely a process, whether natural or artificial, in which it has not some important share. When combined with caloric, it is called *oxygen gas*, which forms one of the constituent parts of the atmosphere. It is so *essential* to combustion, that no substance will burn in common air which has been previously deprived of its oxygen. It is also essential to the support of animal life; so that man, and all the inferior ranks of animated nature, may be said to depend upon this fluid for their existence. Its basis gives the *acid* character to all mineral and vegetable salts; and the *calcination* of metals is altogether effected by their union with oxygen. It constitutes the basis both of the atmosphere which surrounds the earth, and of the water which forms its rivers, seas, and oceans. It pervades the substance of all the vegetable tribes, and enables them to perform their functions; and, in combination with the different metals, serves the most important purposes in the useful arts.*

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* One of the most extraordinary effects of oxygen appears, when it is combined in a certain proportion with nitrogen, so as to form *nitrous oxide*. This gas consists of 36 parts nitrogen and 37 oxygen; and, *when inhaled* into the lungs, produces an extraordinary elevation of the *animal spirits*, a propensity to leaping and running, involuntary fits of *laughter*, &c. This circumstance shows what a variety of delightful

Nitrogen, or *azote*, is also generally diffused throughout nature, and particularly in animal bodies. Combined with caloric it forms *nitrogen gas*, one of the ingredients of the atmosphere. It is incapable of supporting either flame or animal life, as may be proved by introducing an animal, or a burning candle, into a vessel full of this gas; the animal is suddenly suffocated, and the candle instantly extinguished. It is this gas which is expelled from the lungs at every expiration, and, rising over our heads, soon enters into new combinations. Though it is destructive to animal life, it appears to be favourable to plants, which vegetate freely when surrounded with nitrogen.

Hydrogen is another elementary substance abundant in nature; when united to caloric it forms hydrogen gas. It is one of the constituent parts of *water*, there being 85 parts by weight of oxygen, and 15 of hydrogen, in every hundred parts of this fluid. This gas was formerly known by the name of *inflammable air*. It is distinguished among miners by the name of *fire-damp;* it abounds in coal-mines, and sometimes produces the most tremendous explosions. It is incapable, by itself, of supporting combustion, and cannot be breathed without the most imminent danger. It is the chief constituent of oils, fats, spirits, ether, coals, and bitumen; and is supposed to be one of the agents which produce the *ignes fatui*, and the *northern lights*. It is the *lightest* of all ponderable bodies, being from twelve to fifteen times lighter than common air, and, on this account, it is used for filling *air-balloons*. *Carburetted hydrogen gas*, which is *carbon* dissolved in hydrogen, is that beautiful gas

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or pernicious effects might flow from the slightest change in the constitution of the atmosphere, were the hand of the Almighty to interpose in altering the proportion of its constituent parts; for atmospheric air is composed of 79 parts of nitrogen, and 21 of oxygen, which is not a very different proportion from the above. Another gas, called *nitric* oxide, composed of 56 parts of oxygen, and 44 nitrogen, produces instant suffocation in all animals that attempt to breathe it. One of the most corrosive acids, aquafortis, is composed of 75 parts oxygen and 25 parts nitrogen; so that we are every moment breathing a certain substance, *which, in another combination, would produce the most dreadful pain, and cause our immediate destruction.*

which is now employed in lighting our streets, shops, and manufactories.

Carbon is another simple substance extensively diffused throughout nature. It is found pure and solid only in the *diamond;* but it may be procured in a state of *charcoal,* by burning a piece of wood closely covered with sand in a crucible. Carbon enters into the composition of bitumen and pit-coal, and of most animal and some mineral substances; and it forms nearly the whole of the solid basis of all vegetables, from the most delicate flower to the stately oak. It is also a component part of sugar, and of all kinds of wax, oils, gums, and resins. *Carbonic acid gas* is a combination of carbon and oxygen. It is found in a state of combination with lime, forming limestone, marble, and chalk; and may be separated from them by heat, or by means of the mineral acids. This gas, which was formerly called *fixed air,* is found in mines, caves, the bottoms of wells, wine-cellars, brewers' vats, and in the neighbourhood of limekilns. It is known to miners by the name of the *choke-damp,* and too frequently runs on deadly errands. It extinguishes flame and animal life. It is the heaviest of all the gases; being nearly twice the weight of common air, and twenty times the weight of hydrogen. It may, therefore, be poured from one vessel to another; and if a small quantity of it be poured upon a lighted taper, it will be instantly extinguished. There is no substance of more importance in civilized life than the different forms of *carbon.* "In nature," says Sir H. Davy, "this element is constantly active in an important series of operations. It is evolved in fermentation and combustion, in carbonic acid; it is separated from oxygen in the organs of plants; it is a principal element in animal structures; and is found in different forms in almost all the products of organized beings."

Such are a few of the principal elementary substances, which, in a thousand diversified forms, pervade the system of nature, and produce all that variety which we behold in the atmosphere, the waters, the earth, and the

various processes of the arts. It is probable that some of these substances are compounds, though they have not yet been decomposed. Yea, it is possible, and not at all improbable, that there are but two, or at most three elementary substances in nature, the various modifications of which produce all the beauties and sublimities in the universe.

What an admirable view is here opened up of the economy of Divine wisdom, and of the beneficent care which has been taken to secure the comfort and happiness of every living creature; and how ungrateful a disposition must it indicate in rational beings to overlook such benevolent arrangements! It is highly probable, that in all the other worlds dispersed throughout the universe, an infinite diversity of scenery exists, and that no one globe or system exactly resembles another; and yet it is probable, that the primary elements of matter, or the few *simple substances* of which our world is composed, may be of the same nature as those which form the constituent parts of every other system; and may give birth to all the variety which exists throughout the wide extent of creation, and to all the changes and revolutions through which the different systems may pass, during every period of infinite duration.* DICK.

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* Some idea may be formed from these facts of the claims which the science of chemistry, that has led to the discovery of them, has on our attention. Who could have imagined, a century ago, that an invisible substance contained in a piece of coal may be conveyed, in a few moments, through pipes of several miles in length, and that a city, containing several hundred thousands of inhabitants, may be instantly lighted up by it, without the aid of either wax, oil, or tallow? Who could have imagined, that one of the ingredients of the air we breathe is the principle of combustion—that a rod of iron may be made to burn in it with a brilliancy that dazzles the eyes—and that the *diamond* differs only in a slight degree from a bit of common charcoal? Who could have surmised, that a substance would be discovered, of such a degree of levity, as would have power sufficient to buoy up a number of men to the upper parts of the atmosphere? Yet these are only specimens of the brilliant discoveries which have been brought to light by the science of chemistry!

THE QUANTITY OF MATTER IN THE UNIVERSE.

The earth is a globe about 8000 miles in diameter, and 25,000 in circumference; and, consequently, its surface contains nearly two hundred millions of square miles—a magnitude too great for the mind to take in at *one* conception. In order to form a tolerable conception of the whole, we must endeavour to take a leisurely survey of its different parts. Were we to take our station on the top of a mountain of a moderate size, we should perceive an extent of view stretching 40 miles in every direction, forming a circle 80 miles in diameter, and 250 in circumference, and comprehending an area of 5000 square miles. In such a situation, the scene around us, consisting of hills and plains, towns and villages, rivers and lakes, would form one of the largest objects which the eye, or even the imagination, can steadily grasp at one time. But such an object, grand and extensive as it is, forms no more than the *forty-thousandth part* of the terraqueous globe; so that, before we can acquire an adequate conception of the magnitude of the world, we must conceive 40,000 landscapes of a similar extent to pass in review before us; and, were a scene of equal magnitude to pass before us every hour, and were twelve hours a day allotted for the observation, it would require 9 years and 48 days before the whole surface of the globe could be contemplated, even in this *general* and *rapid* manner.

Again, the surface of the earth contains nearly 200,000,000 square miles. Now, were a person to set out on a minute survey of the terraqueous globe, and to travel till he passed along every square mile on its surface, and to continue his route without intermission, at the rate of 30 miles every day, it would require 18,264 years before he could finish his tour; so that, had he commenced his excursion on the day in which Adam was created he would not have accomplished one-third part of this vast tour at the present hour.

These remarks apply to the earth as a mere superficies. But the earth is a solid globe; and its solid contents is no less than 263,858,149,120 cubical miles, a mass of material substance, in proportion to which all the lofty mountains which rise above its surface are less than a few grains of sand, when compared with the largest artificial globe. Were the earth a hollow sphere, surrounded merely with an external shell, 10 miles thick, its internal cavity would be sufficient to contain a quantity of materials *one hundred and thirty-three times* greater than the whole mass of continents, islands, and oceans, on its surface, and the foundations on which they are supported. We have the strongest reasons, however, to conclude, that the earth, in its general structure, is one solid mass, from the surface to the centre, excepting, perhaps, a few caverns scattered here and there amidst its subterraneous recesses; and that its density gradually increases from its surface to its central regions. What an enormous mass of materials, then, is comprehended within the limits of that globe on which we tread! The mind labours, as it were, to comprehend the mighty idea, and, after all its exertion, feels itself unable to take in such an astonishing magnitude at *one* comprehensive grasp. How great must be the power of that Being who commanded it to spring from nothing into existence, who "measures the ocean in the hollow of his hand, who weigheth the mountains in scales, and hangeth the earth upon nothing!"

When we contemplate, by the light of science, those magnificent globes which float in the concave of the sky, the earth, with all its sublime scenery, stupendous as it is, dwindles into an inconsiderable ball. If we pass from our globe to some of the other bodies of the planetary system, we shall find, that one of these stupendous orbs is more than 900 times the size of our world, and encircled with a ring which would nearly reach from the earth to the moon; and that another is of such a size, that it would require 1400 globes of the bulk of the

earth to form one equal to it in dimensions. The whole of the bodies which compose the solar system (without taking the sun and the comets into account) contain a mass of matter 2500 times greater than that of the earth. The sun himself is 520 times larger than all the planetary globes taken together; and one million three hundred thousand times larger than the terraqueous globe. Here the imagination begins to be overpowered and bewildered in its conceptions of magnitude, when it has advanced scarcely a single step in its excursions through the material world.

If we extend our views from the solar system to the starry heavens, we have to penetrate, in our imagination, a space which the swiftest ball that was ever projected, though in perpetual motion, would not traverse in ten hundred thousand years. In those trackless regions of immensity we behold an assemblage of resplendent globes similar to the sun in size, and in glory, and, doubtless, accompanied with a retinue of worlds, revolving, like our own, around their attractive influence. The immense distance at which the nearest stars are known to be placed, proves that they are bodies of a prodigious size, not inferior to our own sun, and that they shine, not by reflected rays, but by their own native light. But bodies encircled with such refulgent splendour would be of little use in the economy of Jehovah's empire, unless surrounding worlds were cheered by their benign influence. Every star is, therefore, concluded to be a sun, no less spacious than ours, surrounded by a host of planetary globes, which revolve around it as a centre, and derive from it light, and heat, and comfort. Nearly a thousand of these luminaries may be seen in a clear winter night by the naked eye; so that a mass of matter equal to a thousand solar systems, or to *thirteen hundred and twenty millions of globes of the size of the earth,* may be perceived, by every common observer, in the canopy of heaven. But all the celestial orbs which are perceived by the unassisted sight do not form the eighty thousandth part of those

which may be descried by the help of optical instruments. Dr Herschel has informed us that, in the most crowded parts of the Milky-way, when exploring that region with his best glasses, he has had fields of view which contained no less than 588 stars, and these were continued for many minutes; so that "in one quarter of an hour's time there passed no less than *one hundred and sixteen thousand stars* through the field of view of his telescope." It has been computed, that nearly *one hundred millions* of stars might be perceived by the most perfect instruments, were all the regions of the sky thoroughly explored. And yet all this vast assemblage of suns and worlds, when compared with what lies beyond the utmost boundaries of human vision, in the immeasurable spaces of creation, may be no more than the smallest particle of vapour to the immense ocean. Immeasurable regions of space lie beyond the utmost limits of mortal view, into which even imagination itself can scarcely penetrate, and which are, doubtless, replenished with the operations of Divine Wisdom and Omnipotence.

Here, then, with reverence, let us pause, and wonder! Over all this vast assemblage of material existence God presides. Amidst the diversified objects and intelligences it contains, he is eternally and essentially present. At his Almighty fiat it emerged from nothing into existence; and by his unerring wisdom all its complicated movements are perpetually directed. Surely that man is little to be envied who is not impressed, by such contemplations, with a venerable and overwhelming sense of the Creator.

DICK.

CAUSES OF THE CELESTIAL MOTIONS.

IF you have seen a correct representation of the motions of the bodies of the solar system, you must have observed, that whilst the sun is at rest in the centre, the planets revolve around him, and the moons or satellites around the planets, *in elliptical* orbits. The cause of this peculiar

motion you will be able to understand by attending to the motion of a body which is attracted by any power towards a certain point, while it is at the same time driven forward by some push given to it at first, and continuing to act on it while it is drawn towards the point. If this attraction be uniform, the body will move in a circle, and the point to which it is constantly drawn will be the centre of the circle. Thus, a stone in a sling, when whirled round the hand, moves in a circle, while it remains in the sling; the force that draws it towards the hand being always the same, and the hand either stopping after setting the stone a-whirling, in which case it is the centre of the circle, or going round in a smaller circle, in which case the point is the centre of the two circles, the one the stone whirls round in, and the one the hand moves round in. If the force that draws the moving body changes at different distances, then the body will move, not in a circle, but in other curve lines of various kinds, according as the proportion of the force to the distance varies, and according also to the direction of the forward push, and the force with which it was originally given. If the force drawing towards the point is such, that, at two feet from the point, it is four times less than at one foot; at three feet, nine times less; at four feet, sixteen times less; and so on, always lessening in the same proportion; and if the body is pushed forward with a particular degree of force,—the line in which it moves will go round the point, but it will be an oval or ellipse; and the point of attraction will be nearer one end of the ellipse than the other.

Now, this is one of the most important truths in the whole compass of science; for it does so happen, that the force with which bodies fall towards the earth—or what is called their *gravity*, the power that draws or attracts them towards the earth—varies with the distance exactly in the proportion of the squares, lessening as the distance *increases*; at two miles from the earth, it is four times *less than* at one mile; at three miles, nine times less;

and so forth. But, by astronomical observations made upon the motion of the heavenly bodies, upon that of the moon for instance, it is proved that her movement is slower and quicker at different parts of her course, in the same manner as a body's motion on the earth would be slower and quicker according to its distance from the point it was drawing towards, provided it was drawn by a force acting in the proportion to the squares of the distance. Therefore she is shown to be attracted towards the earth by a force that varies according to the same proportion in which gravity varies; and she must consequently move in an ellipse round the earth, which is placed in a point nearer the one end than the other of that curve. In like manner, it is shown that the earth moves round the sun in the same curve line, and is drawn towards the sun by the same force; and that all the other planets in their courses, at various distances, follow the same rule, moving in ellipses, and drawn towards the sun by the same kind of power. But this power, which draws them all towards the sun, and regulates their path and their motion round him, and which draws the moons towards the principal planets, and regulates their motion and path round those planets, is the same with the gravity by which bodies fall towards the earth, being attracted by it. Therefore, the heavenly bodies are kept in their places, and wheel round the sun by the same power that makes a stone fall to the ground.

The more full and accurate our observations are upon these heavenly bodies, the better we find all their motions agreeing with this great doctrine; although, no doubt, many things are to be taken into the account besides the force that draws them to their different centres; thus, while the moon is drawn by the earth, and the earth by the sun, the moon is also drawn directly by the sun; and while Jupiter is drawn by the sun, so are his moons; and both Jupiter and his moons are drawn by Saturn; nay, as this power of gravitation is quite universal, and as no body can attract or draw another with-

out being itself drawn by that other, the earth is drawn by the moon, while the moon is drawn by the earth; and the sun is attracted by the planets which he draws towards himself. These mutual attractions give rise to many deviations from the simple line of the ellipse. But extraordinary powers of investigation have enabled us to reduce even the greatest of the irregularities to order and system, and to unfold one of the most wonderful truths in all science, namely, that by certain necessary consequences of the simple fact upon which the whole fabric rests—the proportion of the attractive force to the distances at which it operates—all the irregularities which at first seemed to disturb the order of the system, and to make the appearances depart from the doctrine, are themselves subject to a certain fixed rule, and can never go beyond a particular point, but must begin to lessen when they have slowly reached that point, and then lessen until they reach another point, when they begin again to increase; and so on for ever. Thus, the planets move in ovals, from gravity, the power that attracts them towards the sun, combined with the original impulse they received forwards; and the disturbing forces are continually varying the course of the curves or ovals, making them bulge out in the middle, as it were on the sides, though in a very small proportion to the whole length of the ellipse. The oval thus bulging, however, its length never alters, only its breadth, and that breadth increases by a very small quantity yearly and daily; after a certain number of years it becomes as great as it ever can be; then the alteration takes a contrary direction, and the curve gradually flattens as it had bulged; till, in the same number of years which it took to bulge, it becomes as flat as it ever can be, and then it begins to bulge again, and so on for ever; and so of every other disturbance and irregularity in the system. What at first appears to be some departure from the rule, when more fully examined, turns out to be only a consequence of it.

The power of gravitation, which thus regulates the *whole system* of the universe, is found to rule each mem-

ber or branch of it separately. Thus, it is demonstrated, that the tides of the ocean are caused by the gravitation which attracts the water towards the sun and moon; and the figure both of our earth and of such of the other bodies as have a spinning motion round their axis, is determined by gravitation; they are all flattened towards the end of the axis they spin upon, and bulge out towards the middle. The great discoverer of the principle on which all these truths rest, Sir Isaac Newton, certainly by far the most extraordinary man that ever lived, concluded, by reasoning upon the nature of motion and matter, that this flattening must take place in our globe: every one before his time had believed the earth to be a perfect sphere or globe, chiefly from observing the round shadow which it casts on the moon in eclipses; and it was many years after his death that the accuracy of his opinion was proved by measurements on the earth's surface, and by the different weight and attraction of bodies at the equator, where it bulges, and at the poles, where it is flattened. The improved telescopes have enabled us to ascertain the same fact with respect to the planets Jupiter and Saturn.

BROUGHAM.

INSTANCES OF THE APPLICATION OF NATURAL SCIENCE TO THE ANIMAL KINGDOM.

1. It may be recollected, that when the air is exhausted or sucked out of any vessel, there is no longer the force necessary to resist the pressure of the air on the outside; and the sides of the vessel are therefore pressed inwards with violence; a flat glass would thus be broken, unless it were very thick; a round one, having the strength of an arch, would resist better; but any soft substance, as leather or skin, would be crushed or squeezed together at once. If the air was only sucked out slowly, the squeezing would be gradual, or, if it were only half sucked out, the skin would only be partly squeezed together. This is the very process by which *bees* reach the fine dust and juices of hollow flowers, like the honeysuckle, and some

kinds of long foxglove, which are too narrow for them to enter. They fill up the mouth of the flower with their bodies, and suck out the air, or at least a large part of it; this makes the soft sides of the flower close, and squeezes the dust and juice towards the insect as well as a hand could do, if applied to the outside.

2. We may remember this pressure of the atmosphere as shown by the barometer, the sucking-pump, and the air-pump. Its weight is near 15 pounds on every square inch, so that if we could entirely squeeze out the air between our two hands, they would cling together with a force equal to the pressure of double this weight, because the air would press upon both hands; and if we could contrive to suck or squeeze out the air between one hand and the wall, the hand would stick fast to the wall, being pressed on it with the weight of above two hundred weight. Now, it is found that this is the very process by which *flies* and other insects of a similar description are enabled to walk up perpendicular surfaces, as the sides of walls and panes of glass in windows, and to walk as easily along the ceiling of a room with their bodies downwards and their feet over head. Their feet, when examined by a microscope, are found to have flat skins or flaps, like the feet of web-footed animals, as ducks and geese; and they have towards the back part or heel, but inside the skin or flap, two very small toes so connected with the flap as to draw it close down upon the glass or wall the fly walks on, and to squeeze out the air completely, so that there is a vacuum made between the foot and the glass or wall. The consequence of this is, that the air presses the foot on the wall with a very considerable force compared to the weight of the fly. Some of the larger sea-animals are by the same construction, only upon a greater scale, enabled to climb the perpendicular and smooth surfaces of the ice-hills among which they live. Some kinds of lizard have the same power of climbing, and of creeping with their bodies downwards along the ceiling of a room; and the means by which they are enabled to do so are the same. In the large

feet of these animals the contrivance is easily observed, of the two toes or tightners, by which the skin of the foot is pinned down, and the air excluded in the act of walking or climbing; but it is the very same, only upon a larger scale, with the mechanism of a fly's or butterfly's foot; and both operations, the climbing of the sea-horse on the ice, and the creeping of the fly on the window or the ceiling, are performed exactly by the same power, the weight of the atmosphere, which causes the quicksilver to stand in the weather-glass, the wind to whistle through a keyhole, and the piston to descend in a steam-engine.

3. It is found by chemical experiments, that the juice which is in the stomachs of animals (called the *gastric* juice) has very peculiar properties. Though it is for the most part a tasteless, clear, and seemingly a very simple liquor, it nevertheless possesses extraordinary powers of dissolving substances which it touches or mixes with; and it varies in different classes of animals. In one particular it is the same in all animals; it will not attack living matter, but only dead; the consequence of which is, that its powers of eating away and dissolving are perfectly safe to the animals themselves, in whose stomachs it remains without ever hurting them. This juice differs in different animals according to the food on which they subsist; thus, in birds of prey, as kites, hawks, owls, it only acts upon animal matter, and does not dissolve vegetables. In other birds, and in all animals feeding on grass, as oxen, sheep, hares, it dissolves vegetable matter, as grass, but will not touch flesh of any kind. This has been ascertained by making them swallow balls with meat in them, and several holes drilled through, to let the gastric juice reach the meat; no effect was produced upon it. We may further observe, that there is a most curious and beautiful correspondence between this juice in the stomach of different animals and the other parts of their bodies, connected with the important operations of eating and digesting their food. The use of the juice is plainly to convert what they eat into a fluid, from

which, by various other processes, all their parts, blood, bones, muscles, &c. are afterwards formed. But the food is first of all to be obtained, and then prepared by bruising, for the action of the juice. Now birds of prey have instruments, their claws and beak, for tearing and devouring their food (that is, animals of different kinds), but those instruments are useless for picking up and crushing seeds; accordingly, they have a gastric juice which dissolves the animals they eat; while birds which have only a beak fit for pecking, drinking, and eating seeds, have a juice that dissolves seeds, and not flesh. Nay more, it is found that the seeds must be bruised before the juice will dissolve them; this you find by trying the experiment in a vessel with the juice; and accordingly the birds have a gizzard, and animals which graze have flat teeth, which grind and bruise their food before the gastric juice is to act upon it. BROUGHAM.

APPENDIX.

PREFIXES, AFFIXES, AND PRINCIPAL LATIN AND GREEK ROOTS OF THE ENGLISH LANGUAGE.

(*To be committed to Memory.*)

I. PREFIXES.

1. OF ENGLISH ORIGIN.

A, *on*
Fore, *before*
Mis, *error* or *defect*
Un, *not*

2. OF LATIN ORIGIN.

A, ab, abs, *from*
Ad, ac, al, an, ap, as, ar, at, *to*
Am, *round about*
Ante, *before*
Circum, circu, *about*
Cis, *on this side*
Con, com, co, col, *together*
Contra, *against*
De, *down*
Di, dis, *asunder*
E, ex, *out of*
Extra, *beyond*
In, *in* before a verb, *not* before an adjective
Inter, *between*
Intro, *to within*
Juxta, *nigh to*
Ob, oc, of, op, *in the way of*
Per, *through*
Post, *after*
Pre, *before*
Pro, *forward*
Preter, *beyond*
Re, *back* or *again*
Retro, *backward*
Se, *aside* or *apart*
Sub, subs, sus, *under*
Subter, *beneath*
Super, sur, *above*
Trans, *beyond*

3. OF GREEK ORIGIN.

A implies *privation*
Amphi, *both*
Ana, *through*
Anti, *in opposition to*
Apo, aph, *from*
Cata, caté, *from side to side*
Dia, *through*
Epi, eph, *upon*
Hyper, *over* or *too*
Hypo, *under*
Meta, *beyond*
Para, *against*
Peri, round
Syn, sym, syl, together

II. AFFIXES.

Al, *of*, or *pertaining to*
Ate, *act*
Ation, *action*
Ative, *active*
Ator, *actor*
Ble, *able*
Dom, *dominion*
En, *make*
Ety, *state*
Ful, *full*
Fy, *to make*
Ic, ical, *of*, or *pertaining to*
Ish, *little*, also *of*, or *pertaining to*
Ition, *action*
Ity, *state*
Ize, *make*
Less, *without*
Let, *little*
Ling, *young*
Ly, *like*
Ose, *full*
Ous, *full*
Tion, *action*
Tive, *active*
Ty, *state*
Y, *of*, or *pertaining to*

III. LATIN WORDS, WITH THEIR ENGLISH REPRESENTATIVES.

A

Acris, sharp, *acri*
Acuo, I sharpen, *acu*, *acut*
Aedes, a house, *edi*
Aequus, equal, *equa*, *equi*
Aër, *air*, *aër*
Aetas, *eti*
Aether, the sky, *ether*
Aevum, an age, *aev*, *ev*
Ager, a field, *agri*
Agger, a heap, *agger*, *aggre*
Ago, I do, *ag*, *act*
Ala, a wing, *ali*
Alienus, belonging to another, *alien*
Altus, high, *alt*
Amo, I love, *ami*
Amor, love, *amor*
Ango, anxi, I vex, *angu*, *anxi*
Animus, mind, *anim*
Annus, a circle, a year, *annu*, *enni*
Apto, I fit, aptus, suitable, *apt*
Aqua, water, *aqua*, *aque*
Arbor, a tree, *arbor*

Arceo, I drive away, *erce*
Ardeo, I burn, *ard*, *ars*
Arma, arms, *armi*
Aro, I plough, *ara*
Ars, art, *arti*, *ert*
Asper, rough, *asper*
Audio, I hear, *audi*
Avis, a bird, *avi*

B

Barba, a beard, *barb*
Beatus, blessed, *beati*
Bellum, war, *belli*
Bene, well, *bene*
Bibo, I drink, *bibe*
Bis, twice, *bi*, *bis*
Brevis, short, *brevi*

C

Cado, I fall, casus, fallen (changed into cĭdo, when compounded), *cad*, *cas*, *casu*, *cid*, *cide*
Cædo, I cut, cæsus, cut (changed into cīdo and cīsus when compounded), *cide*, *cis*, *cise*

Campus, a plain, *camp*
Cano, canto, I sing, *cant*, *cent*
Capillus, hair, *capill*
Capio, I take, captus, taken (cipio and ceptus when compounded), *capt*, *cept*, *ceive*
Caput, the head, *capit*, *cipit*
Carcer, a prison, *carcer*
Carus, dear, *car*, (through the French) *cher*
Caro, carnis, flesh, *carni*
Cavus, hollow, *cav*, *cave*
Cedo, I give place, I go, cessio, a giving place to, *cede*, *ceed*, *cess*
Celer, swift, *celer*
Celo, I hide, *ceal*
Centum, a hundred, *cent*
Cerno, I see, I decree, *cern*
Certus, certain, *certi*
Cetus, a whale, *ceta*
Cinctus, girt about, *cinct*
Cio, I call, I rouse, *cite*, *cit*
Civis, a citizen, *civi*
Clamo, to cry out, *claim*, *clam*
Clarus, clear, *clare*, *clari*
Clino, I bend, *cline*, *clin*
Clivus, a slope, *clivi*
Coelum, heaven, *celes*
Coepi, I begin, *cipi*
Coquo, I boil, *cook*, *coc*
Cor, cordis, the heart, *cord*
Cornu, a horn, *corn*
Cras, to-morrow, *cras*
Credo, I trust, *cred*
Cremo, I burn, *crem*
Crepo, I make a noise, *crep*
Cresco, I grow, *crease*
Crux, crucis, a cross, *cruci*
Cubo, I lie (cumbo when compounded), *cumb*
Culpa, a fault, culpo, I find fault with, *culp*
Cura, care, *cure*, *cura*
Curro, I run, *cur*
Cursus, a running, *course*
Curtus, short, *curt*

D

Damno, I condemn, damnum, loss, *demn*, *dam*
Datus, given (ditus when compounded), *dit*
Decus, decoris, grace, honour, *decor*
Dens, a tooth, *dent*
Densus, thick, *dense*
Deus, a god, *dei*
Dexter, right-handed, clever, *dexter*
Dico, I say, dictus, said, *dict*
Dignus, worthy, meet, *digni*
Doceo, I teach, doctus, taught, *doc*, *doct*
Doleo, I grieve, *dole*
Dolor, grief, *dolor*
Dominus, a master, *domin*
Domo, I subdue, *dom*
Domus, a house, *dom*
Donum, a gift, *don*
Duco, I lead, *duce*, *duct*
Duo, two, *du*, *dua*

E

Ebrius, drunken, *ebri*
Edo, I eat, *edi*
Ego, I, *ego*
Emo, I buy, emptus, bought, *eem*, *empt*
Eo, I go, itum, to go, *it*
Erro, I wander, *err*
Exter, outward, *exter*

F

Faber, a workman, *fabri*
Facilis, easy, *facil*
Facio, I make, factus, made (ficio and fectus when compounded) *fact*, *fect*, *fic*, *fice*
Fallo, I deceive, *fall*
Fanum, a temple, *fan*, *fane*
Fari, to speak, *fab*
Felix, felicis, happy, *felici*
Femina, a woman, *femin*
Fero, I carry, *fer*

Fictus, feigned, *fict*
Fido, I trust, *fide*
Filia, a daughter,
Filius, a son, *fili*
Finis, an end, *fin*
Fio, I become, *fy*
Firmus, strong, *firm*
Fissum, a cleft, *fiss*
Flamma, a flame, *flam*, *flame*
Flatus, a puff of wind, *flat*, *flate*
Flecto, I bend, *flect*, *flex*
Fligo, I dash, flictus, dashed, *flict*
Flos, floris, a flower, *flor*
Fluctus, a wave, *fluctu*
Fluo, I flow, *flux*, *flu*
Foedus, foederis, a treaty, *foder*
Fors, chance, *fortu*
Fortis, strong, *forti*
Frango, I break, fractus, broken, *frang*, *fringe*, *fract*, *frag*
Frater, a brother, *frater*
Frigeo, I am cold, *frigi*
Fructus, fruit, *fructu*
Fruor, I enjoy, *frui*
Frustra, in vain, *frustra*
Fugio, I fly, *fuge*, *fugi*
Fulgeo, I shine, *fulge*
Fulmen, lightning, *fulmin*
Fumus, smoke, *fum*, *fume*
Fundo, I pour out, fusus, poured out, *fund*, *fus*, *fuse*
Furo, I am mad, *fur*, *furi*

G

Gallus, a cock, *galli*
Gelu, frost, *geal*, *geli*
Gens, gentis, a nation, *gent*
Genu, a knee, *genu*
Genus, kind or kindred, genera, kinds, *gener*
Germen, a branch, *germ*, *germin*
Gero, I carry, gestus, carried, *ger* *gest*
Gigno, I beget, *gen*
Glacies, ice, *glaci*
Glomus, glomeris, a clue, *glomer*
Gradior, I go, gradus, a step, gressus, having gone, *grad*, *grade*, *gree*, *gress*
Gramen, grass, *gramini*
Grandis, great, *grand*, *grandi*
Gratus, grateful, *grat*, *grate*, *grati*
Gravis, heavy, *grave*, *gravi*
Gusto, I taste, *gust*

H

Habeo, I have, habitus, had, *hab*, *habit*
Haereo, I stick, haesus, stuck, *her*, *here*, *hes*
Haeres haerēdis, an heir, *heired*
Halo, I breathe, *hal*, *hale*
Haurio, I draw, haustus, drawn, *haust*
Herba, a herb, *herba*, *herbi*
Hiems, winter, *hiem*
Hilăris, cheerful, *hilar*
Histrio, a player, *histrion*
Homo, a man, *homi*, *hum*
Hortor, I exhort, *hort*
Hospes, hospitis, a guest, *hospit*
Hostis, an enemy, *hosti*
Humidus, moist, *humid*
Humus, the ground, *hum*

I

Idem, the same, *iden*
Ignis, fire, *igne*, *igni*
Index, a discoverer, *indic*
Infra, below, *infer*
Insula, an island, *insula*
Intra, within, *inter*
Intus, within, *int*
Ira, anger, *ira*, *irrit*
Iter, itineris, *itiner*
Iterum, again, *iter*

J

Jaceo, I lie, *jacent*
Jacio, I throw, jactus, thrown (jicio and jectus when compounded), *ject*
Janua, a gate, *jani*

Judex judicis, a judge, *judici*
Jugum, a yoke, *jug*
Jungo, I join, junctus, joined, *junct*
Juro, I swear, *jure*
Jus juris, right, law, *jur*, *juri*, *juris*
Juvenis, a youth, *juveni*
Juvo, I assist, jutus, assisted, *jut*

L

Labor, I slide, lapsus, having slided, *laps*
Lac, lactis, milk, *lact*
Lacer, torn, *lacer*
Laedo, I hurt, laesus, hurt (lido and lisus when compounded), *lide*, *lis*
Lana, wool, *lani*
Lapis, lapidis, a stone, *lapid*
Latus, carried, *lat*, *late*
Latus, lateris, a side, *later*
Laus, laudis, praise, *laud*
Lavo, I wash, lotus, washed, *lavo*, *lot*
Laxus, loose, *lax*
Legatus, an ambassador, *legat*
Lego, I gather, I choose, lectus, gathered, *lege*, *lect*
Lenis, gentle, *leni*
Lentus, gentle, *lent*
Leo, a lion, *leo*
Lethum, letum, death, *leth*, *let*
Levis, light, *levi*
Lex legis, a law, *leg*
Liber, a book, *libra*
Liber, free, *liber*
Libido, lust, *libidi*
Libra, a balance, *libra*, *libri*
Licet, it is lawful, *licit*
Lignum, wood, *ligne*
Ligo, I bind, *liga*
Linguo, I leave, *lingu*, *lict*
Liqueo, I melt, *lique*
Lis litis, strife, *lit*
Litera, a letter, *litera*
Locus, a place, *loca*

Loqui, to speak, *loquy*, *loqui*, *loqua*
Lucrum, gain, *lucra*
Lucto, I struggle, *luct*
Ludus, play, *ludi*, *lus*
Lumen, light, *lumin*
Luna, the moon, *luna*
Lustro, I purify, I shine, *lustr*, *lustri*
Lux lucis, light, *luc*, *luci*

M

Macies, leanness, *macia*
Macula, a spot, *macula*
Magnus, great, *magni*
Male, wickedly, *mal*, *male*, *mali*
Mamma, a breast, *mammi*
Mando, I bid, *mand*
Mando, I chew, *mand*
Maneo, I stay, *main*, *mans*
Mano, I flow, *man*
Manus, a hand, *manu*
Mare, the sea, *mari*
Mater, a mother, *mater*, *matri*
Maturus, ripe, *matur*
Medius, middle, *media*
Mel, honey, *melli*
Melior, better, *melior*
Mens mentis, the mind, *ment*
Meo, I go, *mea*
Mereo, I desire, *merit*
Mergo, I plunge; mersus, plunged, *merg*, *mers*
Mille, a thousand, *mille*
Minus, less, *min*
Mirus, wonderful, *mir*
Miser, wretched, *miser*
Mitis, mild, *miti*
Mitto, I send, missus, sent, *mit*, *miss*
Modus, a measure, *mod*
Mollis, soft, *molli*
Moneo, I warn, *mon*
Mors mortis, death, *mort*
Mos moris, a manner, *mor*
Multus, many, *multi*
Munio, I fortify, *muni*

Munus, muneris, a gift, *muner*
Murus, a wall, *mure*
Muto, I change, *muta*

N

Nasus, the nose, *nas*
Natus, born, *nat*
Navis, a ship, *nav*, *navi*
Necto, I tie, nexus, tied, *nect*, *nex*
Nego, I deny, *neg*, *nega*
Nervus, a sinew, *nerv*
Niger, black, *negri*, *negro*
Nihil, nothing, *nihil*
Nocuus, noxious, hurtful, *nocu*, *noxi*
Nomen, a name, *nomin*
Non, not, *non*
Norma, a rule, *norm*
Novus, new, *nov*
Nox, noctis, night, *nox*, *noct*
Nubo, I marry, nuptus, married, *nub*, *nupt*
Nudus, naked, *nude*
Nugae, trifles, *nugat*
Nullus, none, *nulli*
Numerus, a number, *numera*
Nuncio, I tell, *nunc nounce*
Nutrio, I nourish, *nutri*

O

Occulo, I hide, *occult*
Octo, eight, *octo*
Oculus, the eye, *ocul*
Odium, hatred, *odi*
Odor, smell, *odor*
Ossa, bones, *osse*
Oleo, I smell, *ol*
Omnis, all, *omni*
Onus, oneris, a burden, *oner*
Opto, I wish, *opt*
Opus, operis, a work, *opera*
Orbis, a circle, *orb*
Oriens, rising, eastern, *orient*
Orno, I deck, *orn*
Oro, I beg, *or*, *oro*
Os, oris, the mouth, *ora*
Otium, ease, *oti*

P

Pactus, having bargained, *pact*
Pando, I spread, passus, or pansus, spread, *pand*, *pass*, *pans*, *panse*
Par, equal, *par*
Pareo, I appear, *par*, *pear*
Paro, I prepare, *par pare*
Pasco, I feed, pastus, fed, *past*
Passer, a sparrow, *passer*
Pater, a father, *pater*, *patri*, *parri*
Pauci, few, *pauci*
Pauper, poor, *pauper*
Pax, pacis, peace, *paci*
Pecco, I sin, *pecc*
Pectus, pectoris, the breast, *pector*
Peculum, money, *pecul*
Pecunia, money, *pecunia*
Pello, I drive away, pulsus, driven, *pel*, *puls*
Pendo, I hang, pensus, hung, *pend*, *pens*, *pense*
Pene, almost, *pen*
Penna, a feather, *penna*
Pes pedis, the foot, *ped*
Pingo, I paint, pictus, painted. *pict*
Piscis, a fish, piscor, I fish, *pisca*
Placeo, I please, *plac*
Placo, I appease, *placa*
Plaudo, I clap my hands, plausus, a clapping, *plaud*, *plause*
Plebs, the common people, *pleb*
Plecto, I twist, plexus, twisted. *plex*
Plenus, full, *pleni*
Plico, I fold, *plic*
Ploro, I wail, *plor*, *plore*
Plumbum, lead, *plum*, *plumb*
Pono, I place, positus, placed, *pone*, *pose*, *posi*
Populus, the people, *popul*
Porto, I carry, *port*
Potens, powerful, *potent*
Poto, I drink, pot
Praeda, plunder, preda
Pravus, wicked, prav

Precor, I pray, *prec*
Prehendo, I take, prehensus, taken, *prehend, prehens*
Pretium, a price, *preci*
Primus, first, *prim*
Probo, I prove, *prob*
Pudens, bashful, *pudent*
Puer, a boy, *puer*
Pugna, a fight, *pugna*
Puto, I prune, I think, *put, pute*
Putris, rotten, *putre, putri*

Q

Quaero, I ask, quaesitus, sought, *quir, quire, quest, quisit*
Quatio, I shake, quassus (cussus when compounded), shaken, *cuss*
Quatuor, four, *quadr, quater*
Queror, I complain, *queru*
Quies, quietis, quiet, *quiet, quies*
Quinque, five, *quin*

R

Radius, a ray, *radi*
Radix, radicis, a root, *radic*
Rado, I scrape, rasus, scraped, *ras, rase*
Ramus, a branch, *rami*
Rarus, thin, *rare, rari*
Ratio, reason, *ration*
Rectus, straight, *rect, recti*
Rego, I rule, rectus, ruled, *reg, rect*
Retè, a net, *reti*
Retro, backward, *retro*
Rideo, I laugh at, risus, laughed at, *ride, ris*
Rigo, I water, *rig*
Rodo, I gnaw, rosus, gnawed, *rode, ros*
Rota, a wheel, *rota*
Ructo, I belch, *ruct*
Rumen, the cud of beasts, *rumin*
Rus ruris, the country, *rur*

S

Sacer, sacred, sacri, secr
Sagus, wise, *saga*
Sal, salt, *sal*
Salio, I leap, saltus, leapt (silio and sultus when compounded) *salt, sile, sult*
Salvus, sound, *salva*
Sanctus, holy, *sancti*
Sanguis, sanguinis, blood, *sanguin*
Sanus, sound, *sane, sani*
Satis, enough, satio, I satisfy, *satis, sati*
Satur, full, *satur*
Saxum, a rock, *saxi*
Scando, I climb, *scend, scent*
Scindo, I cleave, *scind*
Scio, I know, *sci*
Scribo, I write, scriptus, written, *scrib, script*
Scrutor, I search, *scrut*
Sculpo, I carve, sculptus, carved, *sculpt*
Scurra, a scoffer, *scurri*
Seco, I cut, sectus, cut, *sect*
Sedeo, I sit, sessus, sat, *sess*
Semen, seed, *semin*
Semi, half, *semi*
Senex, old, *seni*
Sentio, I feel, sensus, felt, *senti, sens, sensi*
Sidus sideris, a star, *sider*
Signum, a mark, signo, I mark, *sign, signa, signi*
Silva, a wood, *silva*
Similis, like, *simil*
Simulo, I feign, *simul, sembl*
Sinè, without, *sinè*
Sisto, I stop, *sist*
Socius, a companion, *soci*
Sol, the sun, *sol*
Solor, I comfort, *sole, sol*
Solvo, I loose, solutus, loosed, *solve, solu*
Solus, alone, *soli*
Somnus, sleep, *somni*
Sopor, sleep, *sopori*
Sorbeo, I suck in, sorptus, sucked in, *sorb, sorpt*

Sors, sortis, a lot, *sort*
Spargo, I spread, sparsus, spread (spergo and spersus when compounded), *spers*, *sperse*
Specio, I see, spectus, seen, *spect*
Specula, a watch tower, speculor, I watch, *specula*
Spero, I hope, *sper*, *spair*
Spiro, I breathe, *spir*, *spire*
Splendeo, I shine, *splend*
Spondeo, I promise, sponsus, promised, *spond*, *spons*
Stillo, I drop, *still*
Stimulus, a spur, *stimul*
Stinguo, I put out light, stinctus, extinguished, *stinguish*, *stinct*
Stipula, a straw, *stipula*
Stirps, the trunk of a tree, offspring, *stirp*
Sto, I stand, stans, standing, statum, to stand, *stat*, *stant*
Stringo, I hold fast, strictus, held fast, *string*, *strict*
Struo, I pile up, structus, piled up, *strue*, *struct*.
Stultus, a fool, *stulti*
Stupeo, I am stupid, *stup*
Suadeo, I advise, suasus, advised, *suade*, *suas*
Suavis, sweet, *suavi*
Sumo, I take, sumptus, taken, *sum*, *sume*, *sumpt*
Surgo, I rise, surrectus, risen, *surg*, *surrect*

T

Taceo, I am silent, *tacit*
Tango, I touch, tactus, touched, *tang*, *ting*, *tact*
Tardus, slow, *tard*
Tectum, a covering, *tect*
Tempus temporis, time, *tempor*
Tendo, I stretch, tentus, stretched, *tend*, *tent*
Teneo, I hold, tentus, held, *tain*, *tent*
Tenuis, thin, *tenu*
Tepeo, I am warm, *tepi*
Tero, I rub, tritus, rubbed, *trit*
Terra, the earth, *terra*, *ter*
Terreo, I affright, *terri*
Testis, a witness, *test*
Texo, I weave, textus, woven, *text*
Tollo, I lift up, *toll*
Torqueo, I twist, tortus, twisted, *tort*
Tracto, I handle, *tract*
Traho, I draw, tractus, drawn, *tract*
Tribuo, I give, *tribu*
Tuor, I look, *tui*
Turba, a crowd, *turb*
Turgo, I swell, *turg*
Turpis, base, *turpi*

U

Umbra, a shadow, *umbra*
Unda, a wave, *unda*, *undu*
Ungo, I anoint, unctus, anointed, *unct*
Unus, one *uni*
Urbs, a city, *urb*
Uro, I burn, ustus, burnt, *us*
Utilis, useful, *util*
Uxor, a wife, *uxor*

V

Vacca, a cow, *vacc*
Vaco, I am empty, *vacu*
Vacuus, empty, *vacu*
Vado, I go, *vade*, *vas*, *wade*
Vagor, I wander, *vaga*, *vagr*
Valeo, I am strong, valent, *valid*
Vasto, I lay waste, *vast*
Veho, I carry, *vey*, *vehi*
Vello, I pull, vulsus, pulled, *vul*
Venio, I come, ventus, come, *vene*, *vent*
Ver, the spring, *vern*
Verus, true, *ver*, *veri*
Verto, I turn, versus, turned, *vert*, *vers*
Vestis, a garment, *vest*
Vetus, veteris, old, *veter*
Via, a way, *vi*, *via*

Video, I see, visus, seen, *vide*, *vis*
Vigil, watchful, *vigil*
Vinco, I conquer, victus, conquered, *vince*, *vict*
Vindex, a defender, *vindic*
Vita, life, *vita*
Vivo, I live, *viv*, *vive*
Voco, I call, vox, the voice, vocatus, called, *voc*, *voca*
Volvo, I roll, volutus, rolled, *volve*, *volu*
Voro, I devour, *vour*, *vor*
Vulgus, the rabble, *vulg*

IV. GREEK PRIMITIVES.

A—HA

Angello, I bring tidings, as Ev*angel*ist
Hagios, holy, as *Hagio*graphy
Ago, I lead, as Dem*agog*ue
Adelphos, a brother, as Phil*adelphia*
Aethlos, a combat, as *Athle*tic
Akouo, I hear, as *Acous*tics
Aner, andros, a man, as Di*andria*
Anthos, a flower, as *Antho*logy
Anthropos, a man, as Phil*anthropy*
Aristos, best, as *Aristo*crat
Arithmos, number, as *Arithme*tic
Artos, bread, as *Arto*carpus
Arché, beginning, sovereignty, as Hept*arch*y
Asthma, breath, as *Asthma*tic
Asphaltos, bitumen, as *Asphalt*ic
Atmos, vapour, as *Atmo*sphere
Autos, he himself, as *Auto*graph

B

Bapto, I wash, as *Bapt*ism
Baros, weight, as *Baro*meter
Biblos, paper, a book, as *Bible*, *Biblio*graphy
Bios, life, as *Bio*graphy
Bolbos, an onion, as *bulb*ous

G

Gaster, the belly, as *Gast*ric, *Gastronomy*
Ge, the earth, as Geography
Glossa, glotta, the tongue, as *Glossary*, Poly*glott*
Graphè, a description, grapho, I write, as Auto*graph*, Hydro*graphy*
Gynè, a woman, as Mono*gyn*ia
Gyros, a circle, as *gyr*ation
Gonia, a corner, an angle, as Poly*gon*

D

Daktylos, a finger, as *Dactyl*
Deka, ten, as *Deca*logue
Dendron, a tree, as *Dendre*tic
Deuo, I wet, as Be*dew*
Demos, the people, as *Demo*cracy
Dokeo, I think, doxo, I will think, dedogmai, I have been judged, doxe, an opinion, as Ortho*dox*, *Dogma*tize
Dromos, a course, as Hippo*drome*
Drus, an oak, as *Dru*id
Dynamis, power, as *Dynamics*

E—HE

Ethos, a custom, as *Eth*ical
Eidos, a form, as Kal*eido*scope
Hecaton, a hundred, as *Hecatomb*
Hex, six, as *Hexagon*
Hepta, seven, as *Heptagon*
Epos, a word, as Ortho*epy*
Ergon, work, as Energetic
Erēmos, a desert, as Eremite
Eu, well, as Eulogy, Evangelist
Helios, the sun, as Aphelion

Hemera, a day, as Ephemeral

Z

Zoon, an animal, as *Zoology*, A-*zote*

TH

Thapto, I bury, tapho, I will bury, as Epi*taph*

Theos, God, as A*theist*

HI—I

Hieros, holy, as *Hier*archy

Hippos, a horse, as *Hippo*potamus

Isos, equal, as *Iso*perimetrical

Ichthys, a fish, as *Ichthy*ology

K

Kakos, bad, as *Caco*phony

Kalos, handsome, as *Kal*eidoscope

Kalypto, I cover, kalypso, I will cover, as Apo*calypse*

Kardia, the heart, as Peri*cardium*

Karpos, fruit, as Arto*carpus*

Kephalè, the head, as Hydro*cephalus*

Kosmos, the world, order, as Micro*cosm*, *Cos*metic

Kratos, strength, as Aristo*cracy*

Kyklos, a circle, as Epi*cycle*

L

Laos, the people, as *La*ity

Lithos, a stone, as *Litho*graphy, Chryso*lite*

Logos, a word, description, as *Logo*machy, Chrono*logy*

M

Manthano, I learn, mathetes, a scholar, as *Mathe*matics

Martyr, a witness, as *Martyr*ology

Machè, a fight, as Nau*machy*

Metron, a measure, as Thermo*meter*, Geo*metry*

Micros, little, as *Micro*scope

Misos, hatred, as *Mis*anthrope

Monos, alone, as *Mono*syllable

Morphè, shape, as Meta*morpho*sis

Mythos, a fable, as *Mytho*logy

N

Naus, a ship, as *Nau*tical

Nekros, dead, as *Necro*mancy

Neos, new, as *Neo*logy

Nesos, an island, as Pelopon*nesus*

Nomos, a law, as Astro*nomy*

Nosos, sickness, as *Noso*logy

HO—O

Hodos, a way, as Ex*odus*

Oligos, little, few, as *Olig*archy

Homos, like, as *Homo*logous

Optomai, I see, as *Opt*ical

Orthos, right, as *Ortho*graphy

Ornis, ornithos, a bird, as *Ornitho*logy

Ophis, a serpent, as *Ophi*ology

P

Pais, paidos, a boy, as *Peda*gogue

Pente, five, as *Penta*gon

Petros, a stone, as *Petri*faction

Polemos, war, as *Polem*ical

Poleo, I sell, as Biblio*pole*

Polis, a city, as Metro*polis*

Polys, many, as *Poly*gon

Potamos, a river, as Hippo*potamus*

Presbys, old, presbyteros, older, as *Presbyter*ian

Pteron, a wing, as A*ptera*

Pyr, fire, as *Pyr*ometer

S

Sarx, sarkos, flesh, the body, as *Sarco*phagus

Sitos, corn, as Para*site*

Skopeo, I see, as Tele*scope*

Sophos, wise, as *Soph*ist, Philo*sophy*

Stello, I send, as Apo*stle*

Strepho, I turn, as Peri*streph*ic

T

Telè, distant, as *Tele*scope

Technè, art, as *Techn*ical

Tithemi, I put, I suppose, as Hypothesis

Topos, a place, as Topography

HY

Hygros, wet, as *Hygro*meter
Hydor, water, as *Hyd*rostatics

PH

Phago, I eat, as Anthropo*phagi*
Pharmakon, a drug, as *Pharmacy*
Philos, a friend, as *Phil*anthropy
Phobeo, I fear, as Hydro*phobia*
Phren, the mind, as *Phreno*logy
Phonè, the voice, os Eu*phony*

CH

Chalyps, steel, as *Chaly*beate
Charis, charitos, grace, love, as Eu*charist*, *Charity*
Cheir, the hand, as *Cheiro*graphy
Chilioi, a thousand, as *Chiliad*
Cholè, bile, as *Chole*ric
Chroa, chroma, colour, as A*chromatic*
Chronos, time, as *Chrono*meter
Chrysos, gold, as *Chryso*lite

PS

Pseudo, I deceive, as *Pseudo*-apostle

THE END.

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